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

SRI KRISHNADEVARAYA UNIVERSITY: ANANTAPUR
College of Engineering & Technology
Academic Regulations 2020 (R20) for
B. Tech (Regular-Full time)
(With effect from the Academic Year 2021-22 for the students admitted into I year I semester)

1. Award of the Degree:

A student will be declared eligible for the award of B. Tech. degree if he/she fulfills the following:

i. Pursues a course of study in not less than four and not more than eight academic years.
ii. After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech. course and their admission stands cancelled.
iii. Registers for 163 credits and must secure all the 163 credits.
iv. A student shall be eligible for the award of B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 163 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

2. Programs offered by the College:

The following programs are offered at present as specializations for the B. Tech. course from 2020-2021.

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

and any other course as approved by the authorities of the University from time to time.
The entire course of study is of four academic years in semester pattern (for regular students)and of three academic years in semester pattern (for lateral entry students).

3. Medium of Instructions:

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

4. Minimum Qualification for Admission:

A candidate seeking admission to the first semester of the eight semester B. Tech. Degree Program should have passed the Intermediate Examination of the Board of Intermediate Education of Andhra Pradesh with Mathematics and Physical Sciences (Physics and Chemistry) as optional courses or any other equivalent examination there to recognized by Govt. of Andhra Pradesh, as per AICTE guidelines. For admissions into the third semester of B. Tech Degree Program under lateral entry scheme a candidate should have passed diploma in the respective branch of study as per AICTE guidelines.

5. Structure of the Program:

Every course of B. Tech. Program shall be placed in one of the nine categories as listed in table below:

Table 2: Category wise distribution of credits

S.No.	Category	Code	Suggested breakup of Credits (APSCHE)	Suggested breakup of Credits (AICTE)
1	Humanities and social science including Management courses	HSMC	13.5*	15
2	Basic Science Courses	BSC	21*	25
3	Engineering science courses	ESC	24*	24
4	Professional Core Courses	PCC	51*	48
5	Open Elective Courses	OEC	12*	18
6	Professional Elective Courses	PEC	15*	18
7	Internship, Project Work Seminar	PROJ	16.5*	15
8	Mandatory courses	NCMC	NC	NC
9	Skill Oriented Courses	SOC	10	-
Total Credits			163	163

Minor variation is allowed as per need of the respective disciplines.

There shall be 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., shall be included in the guidelines issued by AICTE.

6. Scheme of Instruction

The scheme of instruction shall be for duration of four academic years for regular students and three academic years for lateral entry students. Each academic year consists of two consecutive semesters (one odd + one even). There shall be 90 working days in each semester, excluding the days allotted for internal examinations, preparation holidays and university examinations. Each working day shall be for duration of six hours of instruction and or seminar/ tutorial work.

Note: Under unavoidable circumstances, the 90 working days can be inclusive of internal examinations.

The details of syllabi and the list of text books and reference books for each branch of study shall be prescribed by the university from time to time on the recommendation of the Board of Studies.

7. Credit Assignment:

Program related terms:

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

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

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

iv. **Massive Open Online Course (MOOC):** The MOOC course is a Discipline Centric Elective Course and the student shall register for the course offered by authorized Institutions/Agencies, through online with the approval of Head of the Department.

v. Each course is assigned certain number of credits based on following criterion:

	Semester	
	Hours / Week	Credits
Theory (Lecture/Tutorial)	02	02
	03	03
	04	04
Practical	02	01
	03	1.5
	04	02
Summer Internship**	2 Months (or 8 weeks)	1.5
Industrial/Research**	2 Months (or 8 weeks)	3
Non-Credit Mandatory Courses	02 / week	00
Project	6 Months (or 24 weeks)	12

Note:

1. Summer Internship for 2 months (Mandatory) after second year (to be evaluated during V semester).
2. The concerned Board of studies can assign tutorial hours to such courses wherever it is necessary, but without change in the total number of credits already assigned for semester.
3. Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester.
4. During Project period the student is supposed to report the Internal Departmental Committee periodically.

8. Weights for Course Evaluation:

8.1 **Course Pattern:**

i. The entire course of study is for four academic years. Semester pattern shall be followed in all the academic years.

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

iii. 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 fulfillment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

8.2 **Evaluation Process:**

The performance of a student in each semester for academic year I,II,III,IV shall be evaluated subject wise with a maximum of 100 marks for theory and 75 marks for practical subject. Project stage-I, Socially relevant project and Internship shall be evaluated for 50 marks each & Project stage-II shall be evaluated for 200 marks whereas mandatory courses with no credits shall be evaluated for 30 internal marks.

1. For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
2. For practical subjects the distribution shall be 25 marks for Internal Evaluation and 50 marks for the End-Examination.

8.3 **Internal Examination Evaluation:**

For theory subjects, during the semester there shall be 2 midterm examinations. Each midterm examination consists of subjective paper for 25 marks with duration of 1hour 30 minutes.

First midterm examination shall be conducted for the first half of the syllabus in the middle of the semester and second midterm examination shall be conducted for the second half of the syllabus towards the end of the semester. A weightage of 0.75 for better score and 0.25 for the other score will be considered for awarding the sessional marks in both the midterm examinations. There shall be two assignments in each semester for award of 05marks so that midterm component will be 30marks (25 for midterm examinations + 05 marks for assignments).

***Note 1:** The subjective paper shall contain Section A with 2 questions of equal weightage of 10 marks and student shall answer any one.Section B shall contain 4 questions equal weightage of 5 marks and student shall answer any three .Any fraction (0.5 & above) shall be rounded off to the next higher mark.
***Note 2:** The assignment shall contains 5 questions of equal weightage of 1 mark each. Which are essay type questions/numerical problems/software development.

If the student is absent for the internal examination, no re-exam shall be conducted and internal marks for that examination shall be considered as zero.
Final Internal marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 75% weightage given to the better mid exam and 25% to the other.
For Example:

Marks obtained in first mid : 24
Marks obtained in second mid : 20
Final Internal Marks: (24x0.75) + (20x0.25) = 23

If the student is absent for any one midterm examination, the final internal marks shall be arrived at by considering 75% 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 : 24
Final Internal Marks: (24x0.75)+ (0x0.25) =18

8.4 **End Examination Evaluation:**

End examination of theory subjects shall have the following pattern:

a. There shall be 8 questions and each question carries 14 marks and Student shall answer any five of them.

8.5 For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 50 end examination marks. Day-to-day work in the laboratory shall be evaluated for 25 marks by the concerned laboratory teacher based on the regularity/record/viva/Internal test. The end examination shall be conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.

8.6 There shall be mandatory courses with zero credits. There shall be no external examination. However, attendance in the audit course 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 every six months/semester at a mutually convenient date of college/student satisfying the conditions mentioned in item 1 & 2 of the regulations.

8.7 The Engineering Drawing/Graphics course, offered is to be treated as a Theory Course. Evaluation method adopted shall be same as for any other Theory Course. The Internal evaluation for sessionals will be 15 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm exams in a semester for a duration of 2 hrs each, evenly distributed over the syllabi, for 15 marks giving a weightage of 0.75 for the better score and 0.25 for the other score will be considered. The sum of day to day evaluation and the internal tests will be the final sessionals for the subject

.

8.8 The laboratory records and internal test papers shall be preserved for a minimum of 2 years in the respective departments as per the Institution norms and shall be produced to the Committees as and when the same are asked for.

8.9. There shall be 05 Professional Elective courses and 04 Open Elective courses. All the Professional & Open Elective courses shall be offered for 03 credits, wherever lab component is involved it shall be (2-0-2) and without lab component it shall be (3-0- 0). If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component.

8.10 All Open Electives are offered to students of all branches in general. However, a student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the Programme.

8.11 A student shall be permitted to pursue up to a maximum of TWO Open Elective courses under MOOCs during the Programme. (See the possibility of Min 1 and Max under MOOCs; avoid paid courses; Coursera, NPTEL, TCS ION to be explored). Each of the courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOCs. Student has to pursue and acquire a certificate for a MOOC only from the organizations/agencies approved by the BoS in order to earn the 3 credits. The Head of the Department shall notify the list of such courses at the beginning of the semester.

8.12 The college shall invite registration forms from the students at the beginning of the semester for offering professional and open elective courses. There shall be a limit on the minimum and maximum number of registrations based on class/section strength.

8.13 **Internships:**

Students shall undergo mandatory summer internships for a minimum of 2 months duration at the end of second and third year of the Programme. There shall also be mandatory full internship for 6 months in the final semester of the Programme along with the project work.

8.14 S**kill Oriented Courses:**

There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain courses and the remaining one shall be a soft skills course.

8.15.**Honors/Minors:**

Under graduate Degree with Honors/Minor shall be issued by the University to the students who fulfill all the academic eligibility requirements for the B. Tech program and Honors/Minor program. The objective is to provide additional learning opportunities to academically motivated students.

9. Attendance Requirements in Academics:

i. A student shall be eligible to appear for University examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
ii. 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.
iii. Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
iv. A stipulated fee shall be payable towards condonation of shortage of attendance to the Institution.
v. 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.
vi. 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 when offered next.
vii. The aggregate percentage of attendance can be rounded to next integer for the purpose of considering for condonation/detention.

For example:

A candidate getting ≥64.5 may be condoned, may be rounded to 65. No attendance shall be added but for condoning purpose can only be considered.

10. Minimum Academic Requirements and Award of the Degree:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in section 9.

10.1 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 internal and end examination marks taken together.

10.2 A student shall be promoted from II Year 2nd to III Year 1st Semester only if he/she fulfils the academic requirement of securing **24 credits** in the subjects that have been studied up to II Year 1st Semester.

10.3 A student shall be promoted from III Year 2nd semester to IV Year 1st semester only if he/she fulfils the academic requirements of securing **42 credits** in the subjects that have been studied up to III Year 1st semester And in case a student is detained for want of credits for particular academic year by sections 10.2 and 10.3 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 III Year 1st semester or IV Year 1st semester as the case may be.

10.4 A student shall register and put up minimum attendance in all 160 credits and earn all the 160 credits.

105 Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

11. 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 or candidate or student, the result of the candidate shall be withheld and the candidate will not be

allowed/promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

12. Award of Grades:

After each subject is evaluated for 100 marks, the marks obtained in each subject 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	S (Superlative)	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 (Below Average)	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 mandatory courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

12.1. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

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

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

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

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

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

where "S_i" is the SGPA of the i^{th} semester and C_i is the total number of credits upto that semester.

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

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

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

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

13. 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	≥ 4.5 < 5.5

14. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship. 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 college shall take the decision on proposals submitted by the students. An evaluation committee constituted by the Principal of the College 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.

15. Transitory Regulations:

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfillment 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 rejoining 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.

16. Curricular Framework for Mandatory Internships

i. It is mandatory to undergo Community Service Project during II Year Summer Vacation with a minimum of 2 months duration.

ii. It is mandatory to undergo Internship during III Year Summer Vacation with a minimum of 2 months duration. The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs.

iii. 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. The report and the oral presentation shall carry 40% and 60% weightages respectively.

iv. In the final semester, the student should mandatorily undergo internship for 6 Months and parallelly 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 project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

v. 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.

17. Curricular Framework for Skill oriented

i For skill oriented/skill advanced course, one theory and 2 practical hours or two theory hours may be allotted as per the decision of concerned BOS.

ii Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

iii A pool of interdisciplinary job-oriented skill courses shall be designed by a common Board of studies by the participating departments/disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.

iv 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/APSSDC or any other accredited bodies as approved by the concerned BoS.

v The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial demand.

vi If a student chooses to take a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency/professional bodies as approved by the Board of studies.

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

viii requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

ix 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. The recommended conversions and appropriate grades/marks are to be approved by the University/Academic Council.

18.Curricular Framework for Honors Programme

Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

i A student shall be permitted to register for Honors program at the beginning of 4th

ii semester provided that the student must have acquired a minimum of 8.0 SGPA upto the end of 2nd

semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

iii Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

iv In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

v Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

vi It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

vii The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOCs as approved by the concerned Head of the department in consultation with BoS.

viii Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component. MOOCs must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOCs. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOCs is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.

ix The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

x If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the Minors will be shown in the transcript. Courses which are dropped under the Minor will not be shown in the transcript.

xi In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech. Degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xii Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

19. Curricular Framework for Minor Programme:

i Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from

Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering.

ii Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

iii The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE,CE,ME etc. or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

iv The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

v There shall be no limit on the number of programs offered under Minor. The University/Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

vi The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOCs as approved by the concerned Head of the department in consultation with BoS.

vii A student shall be permitted to register for Minors program at the beginning of 4^{th} semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) up to the end of 2^{nd} semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4^{th} semester. If a student fails to acquire 8 SGPA up to 3^{rd} semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

viii A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

ix Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

x In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

xi Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

xii A committee should be formed at the level of College/Universities/department to evaluate the

grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

xiii If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

xiv In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

20. General Instructions:

a. The academic regulations should be read as a whole for purpose of any interpretation.
b. Malpractices rules-nature and punishments are appended.
c. Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively.
d. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.
e. The Principal may change or amend the academic regulations of common B.o.S 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 Principal.
f. The above rules and regulations are to be approved/ratified by the College Academic Council as and when any modifications are to be done.

21.MOOCs through SWAYAM Platform:

There shall be five professional elective courses and four open elective courses, which are Choice Based Credit Courses (CBCC), offered from V semester onwards. Among them, one elective course shall be pursued through MOOCs. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's assignment submissions given by SWAYAM. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

A Student must complete the SWAYAM MOOC course in all respects on or before 5 / 6 / 7 semester. Students' MOOC course score in terms of marks/grade/credits will be counted in their 5/6/7 semester marks sheet as the case may be. Students who have qualified in the proctored examinations conducted by the SWAYAM and apply for credit transfer as specified are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the university.

Necessary amendments in rules and regulations regarding adoption of SWAYAM MOOCS courses would be proposed from time to time.

Credit Equivalence for SWAYAM MOOCs Courses: Courses of 04 weeks duration: 01 Credit Courses of 08 weeks duration: 02 Credits Courses of 12 weeks duration: 03 Credits Courses of 16 weeks duration: 04 Credits.

22.Credit Transfer Policy

Adoption of MOOCs is mandatory for all students, 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 40% of the total courses being offered in a particular Programme in a semester through the Online Learning courses through SWAYAM platform (www.swayam.gov.in).

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 through SWAYAM platform.
ii. The online learning courses available on the SWAYAM platform will be considered for credit transfer. SWAYAM course credits are as specified in the platform.
iii. Student registration for the MOOCs shall be only through the institution, it is mandatory for the student to share necessary information with the institution
iv. Credit transfer policy will be applicable to the Professional & Open Elective courses offered by the university under Choice Based Credit System (CBCS).
v. The institution shall select the courses to be permitted for credit transfer through SWAYAM. However, while selecting courses in the online platform institution would essentially avoid the courses offered through the curriculums it may otherwise lead to duplication and repetition of the same course
vi. The University/institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer in the forthcoming Semester.
vii. The institution shall also ensure that the student must complete the course and produce the course completion certificate as per the academic schedule given for the regular courses in that semester
viii. 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.
ix. The university shall ensure no overlap of SWAYAM MOOC exams with that of the university examination schedule. In case of delay in SWAYAM results, the university will re-issue the marks sheet for such students.
x. Student 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.
xi. 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 certificates of completion.
    b. Undertaking form filled by the students for credit transfer.
xii. The university 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 also be permitted to register for MOOCs offered through online platforms other than SWAYAM / NPTEL. In such cases, credit transfer shall be permitted only after seeking approval of the University at least three months prior to the commencement of the semester.

ACADEMIC REGULATIONS FOR B. TECH.(R20)
(LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2022-2023 and onwards)

1. Award of B.Tech. Degree

A student admitted in Lateral Entry Scheme (LES) will be declared eligible for the award of the B.Tech degree if the student fulfills the following academic regulations:

a)Pursues a course of study for not less than three academic years and not more than six academic years.

b) Registers for *124* credits and secures all *124*credits from II to IV year of Regular B. Tech. program.

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

3. All The regulations except 8.1 are to be adopted as that of B. Tech. (Regular).

4. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.9

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 internal evaluation and end examination taken together.

ii A student shall be promoted from III year 2nd Semester to IV year 1st Semester only if the student fulfills the academic requirements of securing **25 credits** of the subjects that have been studied up to III Year 1st 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.

5. Course Pattern

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

5.2. 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.

5.3. 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 fulfillment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

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

RULES FOR DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

S. No.	Nature of Malpractices/Improper conduct	Punishment
	If the Candidate:	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred for four consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for four consecutive semesters from class work and all examinations, if his involvement is established. Otherwise, the candidate is debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the

		remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject only.
6	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. If the candidate physically assaults the invigilator/ officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or Intentionally tears of the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all the examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that

		semester/year. The candidate is also debarred and forfeits the seat. Person (s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations, depending on the recommendation of the committee**.**
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Institution for further action to award suitable punishment.	

Note: -

Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fulfill all the norms required for the award of Degree.

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

SKUCET Curriculum
B. Tech Course Structure – R20
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	0-0-12-0
2		Career Counseling	MC	4-0-4-0
3		Orientation to all branches – career options, tools, etc.	MC	6-0-0-0
4		Orientation on admitted Branch – corresponding labs, tools and platforms	EC	4-0-6-0
5		Proficiency Modules & Productivity Tools	ES	4-2-4-0
6		Assessment on basic aptitude and mathematical skills	MC	4-0-6-0
7		Remedial Training in Foundation Courses	MC	4-2-4-0
8		Human Values & Professional Ethics	MC	6-0-0-0
9		Communication Skills – focus on Listening, Speaking, Reading, Writing skills	BS	4-2-4-0
10		Concepts of Programming	ES	4-0-4-0
Total				40-6-44-0

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 & Electronics Engineering					
I Year Ist Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Linear Algebra & Calculus	BS	3-0-0	3
2.		Applied Physics	BS	3-0-0	3
3.		Communicative English	HS	3-0-0	3
4.		Problem Solving & Programming	ES	3-0-0	3
5.		Engineering Drawing	ES	1-0-4	3
6.		Communicative English Lab	HS	0-0-3	1.5
7.		Applied Physics Lab	BS	0-0-3	1.5
8.		Problem Solving & Programming Lab	ES	0-0-3	1.5
9		Environmental Science	MC	2-0-0	0
				Total	**19.5**

Category	**CREDITS**
Basic Science course	7.5
Engineering Science Courses	7.5
Humanities and social science	4.5
TOTAL CREDITS	**19.5**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical & Electronics Engineering					
I Year IInd Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Differential Equations & Vector Calculus	BS	3-0-0	3
2.		Chemistry	BS	3-0-0	3
3.		Data Structures	ES	3-0-0	3
4.		Basic Civil & Mechanical Engineering	ES	3-0-0	3
5.		Electrical & Electronics Engineering Workshop	ES	0-0-3	1.5
6.		Basic Engineering Workshop	ES	0-0-3	1.5
7.		Data Structures Lab	BS	0-0-3	1.5
8.		Chemistry Lab	ES	0-0-3	1.5
9.		Basic Civil & Mechanical Engineering Lab	ES	0-0-3	1.5
				Total	**19.5**

Category	**CREDITS**
Basic Science course	7.5
Engineering Science Courses	12
TOTAL CREDITS	**19.5**

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 & Electronics Engineering					
II Year I Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Complex Variables & Transforms	BS	3-0-0	3
2.		DC Circuits	PC	3-0-0	3
3.		DC Machines & Transformers	PC	3-0-0	3
4.		Electronic Devices and Circuits	PC	3-0-0	3
5.		Managerial Economics and Financial Analysis	HS	3-0-0	3
6.		Electronic Devices and Circuits Lab	PC	0-0-3	1.5
7.		DC Machines and Transformers Lab	PC	0-0-3	1.5
8.		DC Circuits Lab	PC	0-0-3	1.5
9.		**Skill oriented course – I** Application Development with Python	SC	1-0-2	2
10.		**NCC/NSS ACTIVITIES**			
				Total	**21.5**

Category	**CREDITS**
Basic Science course	3
Professional Core Courses	13.5
Humanities and Social science	3
Skill oriented course	2
TOTAL CREDITS	**21.5**

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electronics & Communication Engineering					
II Year IInd Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Numerical Methods & Probability Theory	BS	3-0-0	3
2.		AC Circuits	PC	3-0-0	3
3.		AC Machines	PC	3-0-0	3
4.		Engineering Electromagnetics	PC	3-0-0	3
5.		Digital Electronics and Logic Design	ES	3-0-0	3
6		UHV-II: Universal Human Values – Understanding harmony and Ethical Human Conduct	HS	2-1-0	3
7.		AC Machines Lab	PC	0-0-3	1.5
8.		AC Circuits Lab	PC	0-0-3	1.5
9.		Digital Electronics and Logic Design Lab	ES	0-0-3	1.5
10.		**Skill Oriented Course –II** Circuits Simulation and Analysis Using Pspice	SC	1-0-2	2
				Total	**24.5**
Community Service Project (Mandatory) for 2 months duration during summer vacation					

Category	**CREDITS**
Basic Science course	3
Humanities and Social Sciences	3
Engineering Science Courses	4.5
Professional Core Courses	12
Skill oriented course	2
TOTAL CREDITS	**24.5**

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 &Electronics Engineering					
III Year I Semester					
SNo	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Electrical Power Generation and Economic Aspects	PC	3 – 0 - 0	3
2		Power Electronics	PC	3 – 0 - 0	3
3		Control Systems	PC	3 – 0 - 0	3
4		**Professional Elective course – I**	PE	3 – 0 - 0	3
5		**Open Elective - I**	OE	3 – 0 - 0	3
6		Power Electronics Lab	PC	0 – 0 -3	1.5
7		Control Systems Lab	PC	0 – 0-3	1.5
8		**Skill oriented course– III** Soft Skills	SC	1 – 0-2	2
Evaluation of Community Service Project/Internship			PR		1.5
				Total credits	**21.5**

List of Professional Electives-I	List of Open Electives-I
1. Power Quality 2. Renewable Energy Sources 3. Computer organization	Candidate should select the subject from list of subjects offered by other departments.

Category	CREDITS
Professional core Courses	12
Professional Elective courses	3
Open Elective Course/Job oriented elective	3
Skill advanced course/soft skill course*	2
Summer Internship	1.5
TOTALCREDITS	21.5

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 &Electronics Engineering					
III Year II Semester					
SNo	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Power System Analysis	PC	3 – 0 - 0	3
2		Measurements & Sensors	PC	3 – 0 - 0	3
3		Digital signal Processing	PC	3 – 0 - 0	3
4		**Professional Elective-II**	PE	3 – 0 - 0	3
5		**Open Elective -II**	OE	3 – 0 - 0	3
6		Power System Simulation Lab	PC	0 – 0 -3	1.5
7		Digital Signal Processing Lab	PC	0 – 0 -3	1.5
8		Measurements & Sensors Lab	PC	0 – 0 -3	1.5
9		**Skill Oriented Course –IV** Soft Computing Tools	SC	1 – 0-2	2
10		**Mandatory Non-Credit Course-III** Indian constitution	MC	2 – 0-0	0
				Total credits	**21.5**
Industrial/Research Internship (Mandatory) for 2 months duration during summer vacation					

List of Professional Electives-II	List of Open Electives-II
1. Transmission & Distribution of electrical power 2. Nonlinear System Analysis 3. Design of Photo voltaic Systems	Candidate should select the subject from list of subjects offered by other departments.

Category	CREDITS
Professional core courses	13.5
Professional Elective courses	3
Open Elective Course/Job oriented elective	3
Skill advanced course/soft skill course*	2
Mandatory course(AICTE)	0
TOTAL CREDITS	**21.5**

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 &Electronics Engineering					
IV Year I Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		**Professional Elective-III**	PE	3 – 0 - 0	3
2		**Professional Elective-IV**	PE	3 – 0 - 0	3
3		**Professional Elective-V**	PE	3 – 0 - 0	3
4		**Open Elective-III**	OE	3 – 0 - 0	3
5		**Open Elective – IV**	OE	3 – 0 - 0	3
6.		**Humanities Elective**	HS	3 – 0 - 0	3
7.		**Skill oriented course– V** Energy Conservation and Audit	SC	1 – 0-2	2
		Evaluation of Summer Internship	PR		3
				Total credits	**23**

List of Professional Electives-III	**List of Professional Electives-V**
1.Power System Operation & Control 2. Switched mode Power Converters 3. Electrical & Electronics Instrumentation	1. Programmable Logic Controllers 2. Linear& Digital IC Applications 3. Embedded Systems
List of Professional Electives-IV	**Humanities Elective**
1. HVDC and FACTS 2. FPGA Based Controller Design 3. Intelligent Control Techniques	1)Entrepreneurship and Design Thinking 2)Management Science 3)Organizational Behavior
List of Open Electives-III & IV Candidate should select the subject from list of subjects offered by other departments.	

Category	**CREDITS**
Professional Elective courses	9
Open Elective Course/Job oriented elective	6
Humanities and Social Science Elective	3
Skill advanced course/soft skill course*	2
Industrial/Research Internship	3
TOTAL CREDITS	**23**

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 &Electronics Engineering					
IV Year II Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L – T-P**	**Credits**
1.		Full Internship & Project work	PROJ	0 – 0-0	12
Total credits					**12**

Category	**CREDITS**
Full Internship & Project work	**12**
TOTAL CREDITS	**12**

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

Electrical & Electronics Engineering

LIST OF OPEN ELECTIVES

Open Electives offered by Dept. of E.E.E(Offered to other Departments)

1.Electrical circuit Theory (OE-1)
2.Generation of Electric Power (OE-2)
3.Renewable Energy Sources (OE-3)
4.Basics of Power Electronics (OE-4)

O**ut of Open elective courses at least one course should be completed through MOOCs**

Open Electives offered by Dept. of E.C.E(Offered to other Departments)

1. Fundamentals of Digital Electronics
2. Basics of Signals and Systems
3. Fundamentals of Communication Systems
4. Fundamentals of Microprocessors and Microcontrollers
5. Microcontroller & Applications
6. Electronic Sensors
7. Electronic Instrumentation
8. Principles of Signal Processing
9. Embedded System Design
10. Introduction to Image Processing
11. Introduction to Internet of things
12. Consumer Electronics

O**ut of Open elective courses at least one course should be completed through MOOCs**

Open Electives offered by Dept. of C.S.E(Offered to other Departments)

1. Principles of Software Engineering (OE-1)
2. Java Programming(OE-2)
3. Fundamentals of Operating Systems (OE-3)
4. Fundamentals of Computer Networks (OE-4)
5. Principles of Database Management Systems
6. Web Technologies
7. Cyber Security

O**ut of Open elective courses at least one course should be completed through MOOCs**

Open Electives offered by Dept. of Mech. Engineering(Offered to other Departments)

1. Manufacturing Process
2. IC Engines
3. Automobile Engineering
4. Non Conventional Sources of Energy
5. Non Destructive Evaluation
6. Workshop Technology
7. Total Quality Management

O**ut of Open elective courses at least one course should be completed through MOOCs**

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

Electrical & Electronics Engineering

Open Electives offered by Dept. of Civil Engineering(Offered to other Departments)

Open Elective-I

1. Engineering Material
2. Dister Mitigation and Management
3. Environmental Economics

Open Elective-II

1. Traffic Engineering
2. Ground Improvement Techniques
3. Environmental Pollution Control

Open Elective-III

1. Environmental Impact Assessment
2. Low Cost-Effective Housing Techniques
3. Water shed Management

Open Elective-IV

1. Construction Planning and Project Management
2. Noise and Air Pollution
3. Geographic Information System GIS

O**ut of Open elective courses at least one course should be completed through MOOCs**

Humanities Electives – I (VII Sem)

1.Entrepreneurship and Incubation
2.Management Science
3.Organizational Behavior

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

Electrical & Electronics Engineering

HONOURS DEGREE IN EEE

Note
1.A student can opt any Four subjects @ 4 credits per subject
2.Concerned BoS can add or delete the subjects as per the decision of the board.
3.Prerequisites to be defined by the board for each course.
4.Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each

S.No.	Course No.	Course Name	L	T	P	Credits
1.		Advance Power Electronics	3	1	0	4
2.		Distributed Generation & Micro Grids	3	1	0	4
3.		Battery Management Systems	3	1	0	4
4.		Grid Integration of Renewable Energy Systems	3	1	0	4
5		MOOC course Introduction to Hybrid and Electric vehicles	0	0	0	2
6		MOOC course Neural Networks for Signal Processing - I	0	0	0	2

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

Electrical & Electronics Engineering

MINORS DEGREE IN EEE

Note

1.A student can opt any Four subjects @ 4 credits per subject
2.Concerned BoS can add or delete the subjects as per the decision of the board.
3.Prerequisites to be defined by the board for each course.
4.Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each)

S.No	Course Code	Course Name	L	T	P	Credits
1.		DC Machines	3	1	0	4
2.		AC Machines	3	1	0	4
3.		Electrical Measurements & instrumentation	3	1	0	4
4.		Basics of Control systems	3	1	0	4
5		MOOC Course (8 Weeks) Renewable Energy sources	0	0	0	2
6		MOOC Course (8 Weeks) Power System Engineering	0	0	0	2

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

Electrical & Electronics Engineering

Note:

1. Eligible and interested students can register either for Honors or for a Minor in IV Semester asper the guidelines issued by the University
2. Students shall register for NCC/NSS/NSO activities and will be required to participate in anactivity for two hours in a week during third semester.
3. Lateral entry students shall undergo a bridge course in Mathematics during third semester

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 & Electronics Engineering					
I Year Ist Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Linear Algebra & Calculus	BS	3-0-0	3
2.		Applied Physics	BS	3-0-0	3
3.		Communicative English	HS	3-0-0	3
4.		Problem Solving & Programming	ES	3-0-0	3
5.		Engineering Drawing	ES	1-0-4	3
6.		Communicative English Lab	HS	0-0-3	1.5
7.		Applied Physics Lab	BS	0-0-3	1.5
8.		Problem Solving & Programming Lab	ES	0-0-3	1.5
9		Environmental Science	MC	2-0-0	0
				Total	**19.5**

Category	**CREDITS**
Basic Science course	7.5
Engineering Science Courses	7.5
Humanities and social science	4.5
TOTAL CREDITS	**19.5**

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

Electrical & Electronics Engineering

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:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- 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.

Bridge Course: Limits, continuity, Types of matrices .

Course Outcomes (CO): Student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications
- Utilize mean value theorems to real life problems
- familiarize with functions of several variables which is useful in optimization
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
- Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

UNIT - I	**Matrix Operations and Solving Systems of Linear Equations**	

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation

UNIT - II	**Mean Value Theorems**	

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof);

UNIT - III	**Multivariable calculus**	

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers

UNIT - IV	**Multiple Integrals**	

Double integrals, change of order of integration, change of variables. Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates. Finding areas and volumes using double and triple integrals.

UNIT - V	**Beta and Gamma Functions**	

Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017

Reference Books:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.
4. T.K.V Iyengar, B. Krishn Gandhi, S. Ranganatham and M.V.S.N. Prasad., S. chand Publishers.

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

Electrical & Electronics Engineering

Course Code	APPLIED PHYSICS (ECE, CSE & EEE Branches)	L	T	P	C
		3	0	0	3

I Year 1st Semester

Course Objectives:

- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization.
- To explain the significant concepts of dielectric and magnetic materials this leads to potential applications.
- To impart knowledge in basic concepts of lasers and optical fiber and its propagation along with its Engineering applications.
- To identify the importance of semiconductors and superconductors in the functioning of electronic devices.
- To teach the concepts related to quantum mechanics and electromagnetic theory which led to their fascinating applications.

Course Outcomes (CO):

- identify the wave properties of light and the interaction of energy with the matter
- apply electromagnetic wave propagation in different guided media
- asses the electromagnetic wave propagation and its power in different media
- calculate conductivity of semiconductors (L3)
- interpret the difference between normal conductor and superconductor
- demonstrate the application of nanomaterials

UNIT - I	**Wave Optics**

Interference: Principle of Superposition-Interference of light-Conditions for sustained Interference - Interference in thin films (reflected light)-Newton's Rings-Determination of Wavelength and refractive index.
Diffraction: Introduction-Fresnel and Fraunhofer diffraction-Fraunhofer Diffraction-Single and Double slits - Diffraction Grating.
Polarisation: Introduction-Types of polarization- Polarisation by reflection and double refraction-Nicol's Prism-Half wave and Quarter wave plate.

UNIT - II	**Dielectric &Magnetic Materials**

Dielectric: Introduction--Dielectric Polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations: Electronic, Ionic and Orientation polarisations (Qualitative) - Lorentz (internal) field-Clausius -Mossotti equation.
Magnetic Materials: Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Classification of Magnetic Materials-Hysteresis-soft and hard magnetic materials

UNIT - III	**Lasers & Fiber Optics**

Lasers: Introduction-Spontaneous and Stimulated emission of radiation-Einstein's coefficients- Population inversion -Pumping Mechanisms-He-Ne laser- Semiconductor laser- Applications of laser.
Fibre optics: Introduction to Optical Fibers-Total Internal Reflection-Critical angle of propagation-Acceptance Angle-Numerical Aperture-Classification of fibers based on Refractive index profile – Propagation of electromagnetic wave through optical fiber–modes-Block Diagram of Fiber optic Communication -Medical Applications.

UNIT - IV	**Quantum Mechanics & Electromagnetic waves**

Quantum Mechanics: Dual nature of matter- Schrodinger's time independent wave equation-Schrodinger's time dependent wave equation-Significance of wave function-Particle in one dimensional infinite potential well.
Electromagnetic waves: Gauss' theorem for divergence and Stokes' theorem for curl (Qualitative)-Fundamental laws of Electric and Magnetic Fields-Derivation of Maxwell's Equations (Integral form and Differential form)-Electromagnetic wave propagation in non-conducting media-Propagation of Electromagnetic waves in dielectric medium.

UNIT - V	**Semiconductors & Superconductors**

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

Electrical & Electronics Engineering

Semiconductors: Introduction-Intrinsic semiconductors – Intrinsic carrier concentration and Fermi level-Intrinsic conductivity – Extrinsic semiconductors - P-type Semiconductor & N-type Semiconductor - Drift and Diffusion currents- Einstien's relation -Hall effect-Hall coefficient - Applications of Hall effect - Applications of Semiconductors.
Superconductors: Introduction-Properties of superconductors-Critical magnetic field-Meissner effect-Josephson Effect (AC & DC)-Types of Superconductors-SQUID-Applications of superconductors.

Textbooks:

1. M. N. Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy" AText book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
2. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2012.

Reference Books:

1. Shatendra Sharma, Jyotsna Sharma, "Engineering Physics", Pearson Education,2018.
2. David J.Griffiths, "Introduction to Electrodynamics"- 4/e, Pearson Education,2014.
3. Applied Physics – P.K.Palanisamy SciTech Publications Pvt. Ltd.,
4. Engineering Physics- K. Vijay Kumar, S. Chand Publications.

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

Electrical & Electronics Engineering

Course Code	COMMUNICATIVE ENGLISH (Common to All Branches of Engineering)	L	T	P	C
		3	0	0	3

I Year 1st Semester

Course Objectives:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing
- .

Course Outcomes (CO):

- Retrieve the knowledge of basic grammatical concepts
- Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
- Apply grammatical structures to formulate sentences and correct word forms
- Analyze discourse markers to speak clearly on a specific topic in informal discussions
- Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
- Create a coherent paragraph interpreting a figure/graph/chart/table

UNIT - I	**On the Conduct of Life: William Hazlitt**	

Lesson: 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. Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. Grammar and Vocabulary: Parts of Speech, Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh- questions; word order in sentences.

UNIT - II	**The Brook: Alfred Tennyson**	

Lesson: Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. Speaking: Discussion in pairs/small groups on specific topics followed by short structured talks. Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. Grammar and Vocabulary: Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

UNIT - III	**The Death Trap: Saki**	

Lesson: 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: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Writing: Summarizing, Paragraph Writing Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

UNIT - IV	**Innovation: Muhammad Yunus**	

Lesson: 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/Report Writing Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; Voice - Active & Passive Voice.		
UNIT - V	**Motivation: The Dancer with a White Parasol: Ranjana Dave**	
Lesson: Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Reading: Reading for comprehension. Writing: Writing structured essays on specific topics using suitable claims and evidences. Grammar and Vocabulary: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)		

Textbooks:

1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. Oxford Learners Dictionary, 12th Edition, 2011
6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)
7. Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words by David Butler
8. A Remedial English Grammar For Foreign Students by Frederick T Wood.
9. Oxford English Grammar Course by Michael Swan & Catherine Walter

Web links

www.englishclub.com
www.easyworldofenglish.comwww.languageguide.org/english/www.bbc.co.uk/learningenglishwww.eslpod.com/index.htmlwww.myenglishpages.com

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

Electrical & Electronics Engineering

Course Code	PROBLEM SOLVING AND PROGRAMMING (Common to all Branches Of Engineering)	L	T	P	C
		3	0	0	3
I Year 1st Semester					

Course Objectives:

- To illustrate the basic concepts of C programming language.
- To discuss the concepts of Functions, Arrays, Pointers and Structures.
- To familiarize with Stack, Queue and Linked lists data structures.
- To explain the concepts of non-linear data structures like graphs and trees.
- To learn different types of searching and sorting techniques

Course Outcomes (CO):

- Analyse the basic concepts of C Programming language.
- Design applications in C, using functions, arrays, pointers and structures.
- Apply the concepts of Stacks and Queues in solving the problems.
- Explore various operations on Linked lists.
- Demonstrate various tree traversals and graph traversal techniques.
- Design searching and sorting methods

UNIT - I	**Introduction to C Language** -

C language elements, variable declarations and data types, operators and expressions, decision statements - If and switch statements, loop control statements - while, for, do-while statements, arrays

UNIT - II	**Functions**

Functions, types of functions, Recursion and argument passing, pointers, storage allocation, pointers to functions, expressions involving pointers, Storage classes – auto, register, static, extern, Structures, Unions, Strings, string handling functions, and Command line arguments.

UNIT - III	**Data Structures**,

Overview of data structures, stacks and queues, representation of a stack, stack related terms, operations on a stack, implementation of a stack, evaluation of arithmetic expressions, infix, prefix, and postfix notations, evaluation of postfix expression, conversion of expression from infix to postfix, recursion, queues - various positions of queue, representation of queue, insertion, deletion, searching operations.

UNIT - IV	**Linked Lists**

Singly linked list, dynamically linked stacks and queues, polynomials using singly linked lists, using circularly linked lists, insertion, deletion and searching operations, doubly linked lists and its operations, circular linked lists and its operations.

UNIT - V	**Trees, Graphs ,Searching & Sorting**

Trees - Tree terminology, representation, Binary trees, representation, binary tree traversals. binary tree operations, **Graphs** - graph terminology, graph representation, elementary graph operations, Breadth First Search (BFS) and Depth First Search (DFS), connected components, spanning trees. **Searching and Sorting** – sequential search, binary search, exchange (bubble) sort, selection sort, insertion sort.

Textbooks:

1. The C Programming Language, Brian W Kernighan and Dennis M Ritchie, Second Edition, Prentice Hall Publication.
2. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni, Susan Anderson-Freed, Computer Science Press.
3. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education.
4. B.A. Forouzon and R.F. Gilberg, “COMPUTER SCIENCE: A Structured Programming Approach Using C”, Third edition, CENGAGE Learning, 2016.
5. Richard F. Gilberg& Behrouz A. Forouzan, “Data Structures: A Pseudocode Approach with C”, Second Edition, CENGAGE Learning, 2011.

Reference Books:

1. PradipDey and Manas Ghosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2. E. Balaguruswamy, "C and Data Structures", 4th Edition, Tata Mc Graw Hill.
3. A.K. Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.
4. M.T. Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.

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

Electrical & Electronics Engineering

Course Code	ENGINEERING DRAWING (Common to CSE, ECE & EEE)	L	T	P	C
		1	0	4	3

I Year 1st Semester

Course Objectives:

- Bring awareness that Engineering Drawing is the Language of Engineers.
- Familiarize how industry communicates technical information.
- Teach the practices for accuracy and clarity in presenting the technical information.
- Develop the engineering imagination essential for successful design.
- Instruct the utility of drafting in orthographic and isometric drawings.
- Train the usage of 2D and 3D modeling.

Course Outcomes (CO):

- draw various curves applied in engineering.
- Show projections of planes graphically
- show projections of solids graphically.
- draw isometric and orthographic drawings

UNIT - I	**IntroductiontoEngineeringgraphics**

PrinciplesofEngineeringGraphicsandtheirsignificance-Conventionsindrawing-lettering-BIS conventions. Conic sectionsincludingtherectangularhyperbola-general and special methods.

UNIT - II	**ProjectionofPoints &Lines:**

Projectionof pointsinanyquadrant,lines inclinedtooneorboth planes,findingtruelengths,angle madebylines

UNIT - III	**Projectionsof RegularPlanes:**

Inclined to one plane and both planes by rotational method.

UNIT - IV	**ProjectionsofSolids:**

Projectionsofregularsolidsinclinedtoone planeand both planes rotational or Auxilaryviewsmethod. – Prism, Cylinder, Pyramid, Cone.

UNIT - V	**IsometricProjections and Orthographic Projections**

IsometricProjections: Principlesof isometric projection- Isometric scale;Isometric views: lines,planes,simplesolids.

OrthographicProjections: Systemsof projections,conventionsandapplicationtoorthographic projections (Conversion of isometric Views to Orthographic Views).

Electrical & Electronics Engineering

Textbooks:

1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
3. Engineering Drawing, Sankar Prasad Dey

Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.
3. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009

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

Electrical & Electronics Engineering

Course Code	COMMUNICATIVE ENGLISH LAB (Common to All Branches of Engineering)	L	T	P	C
		0	0	3	1.5

I Year 1st Semester

Course Objectives:

- students will be exposed to a variety of self-instructional, learner friendly modes of language
- learning
- students will learn better pronunciation through stress, intonation and rhythm
- students will be trained to use language effectively to face interviews, group discussions,
- public speaking
- students will be initiated into greater use of the computer in resume preparation, report writing, format making etc

Course Outcomes (CO):

- Retrieve and reminisce the sounds of English Language
- Understand the different aspects of the English language
- Apply communication skills through various language learning activities
- Analyze the English speech sounds, stress, rhythm, intonation and syllable
- Evaluate and exhibit acceptable etiquette essential in social and professional settings
- Create awareness on mother tongue influence and neutralize it

List of Topics

1. Phonetics
2. Reading comprehension
3. Describing objects/places/persons
4. Role Play or Conversational Practice
5. JAM
6. Etiquettes of Telephonic Communication
7. Information Transfer
8. Note Making and Note Taking
9. E-mail Writing
10. Group Discussions-1
11. Resume Writing
12. Debates
13. Oral Presentations
14. Poster Presentation
15. Interviews Skills-1

Suggested Software

Orel, Walden Infotech, Young India Films

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

Web Links

www.esl-lab.com
www.englishmedialab.com
www.englishinteractive.net

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

Electrical & Electronics Engineering

Course Code	APPLIED PHYSICS LAB (Common to ECE, CSE & EEE Branches)	L	T	P	C
		0	0	3	1.5

I Year 1st Semester

Course Objectives:

- Understands the concepts of interference and diffraction and their applications.
- Understand the role of optical fiber parameters in communication.
- Recognize the importance of energy gap in the study of conductivity and hall effect in a semiconductor.
- Apply the principles of semiconductors in various electronic devices.
- Understand the role of Optical fiber parameters in engineering applications.
- Recognize the significance of laser by studying its characteristics and its application in finding the particle size.

Course Outcomes (CO):

- operate optical instruments like microscope and spectrometer
- determine thickness of a hair/paper with the concept of interference
- estimate the wavelength of different colors using diffraction grating and resolving power
- plot the intensity of the magnetic field of circular coil carrying current with distance
- evaluate the acceptance angle of an optical fiber and numerical aperture
- determine magnetic susceptibility of the material and its losses by B-H curve

Experiments(Execute any 12 experiments)

1. Determination of wavelength of LASER light using diffraction grating.
2. Determine the thickness of the wire using wedge shape method.
3. Determination of the radius of curvature of the lens by Newton's ring method.
4. Determination of Dispersive power of a prism.
5. Magnetic field along the axis of a circular coil carrying current-Stewart Gee's method.
6. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum).
7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle.
8. To determine the energy gap of a semiconductor.
9. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
10. Determination of particle size using LASER.
11. Determination of dielectric constant of dielectric material using charging and discharging of capacitor.
12. Resolving power of a grating.
13. Determination of hysteresis loss by tracing B-H Curve of ferromagnetic material.
14. To determine the measurement of resistance with varying temperature.
15. Resistivity of semiconductor by Four probe method.

References Books:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

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

Electrical & Electronics Engineering

Course Code	PROBLEM SOLVING AND PROGRAMMING LAB (Common to All Branches of Engineering)	L	T	P	C
		0	0	3	1.5

I Year 1st Semester

Course Objectives:

- To get familiar with the basic concepts of C programming.
- To design programs using arrays, strings, pointers and structures.
- To illustrate the use of Stacks and Queues
- To apply different operations on linked lists.
- To demonstrate Binary search tree traversal techniques.
- To design searching and sorting techniques.

Course Outcomes (CO):

- Demonstrate basic concepts of C programming language.
- Develop C programs using functions, arrays, structures and pointers.
- Illustrate the concepts Stacks and Queues.
- Design operations on Linked lists.
- Apply various Binary tree traversal techniques.
- Develop searching and sorting methods.

List of Experiments:

Week l

Write C programs that use both recursive and non-recursive functions

(i)To find the factorial of a given integer.

(ii)To find the GCD (greatest common divisor) of two given integers.

Week 2

a) Write a C program to find both the largest and smallest number in a list of integers.

b) Write a C program that uses functions to perform the following:

i) Addition of Two Matrices ii) Multiplication of Two Matrices

Week 3

a) Write a C program that uses functions to perform the following operations:

i) To insert a sub-string in to a given main string from a given position.

ii) To delete n characters from a given position in a given string.

Week 4

a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn‘t contain T.

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

Week 5

a)Write a C Program to perform various arithmetic operations on pointer variables.

b)Write a C Program to demonstrate the following parameter passing mechanisms:

i) call-by-value ii) call-by-reference

Week 6

Write a C program that uses functions to perform the following operations:

(i)Reading a complex number

(ii)Writing a complex number

(iii)Addition of two complex numbers

(iv)Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Week 7

Write C programs that implement stack (its operations) using

(i)Arrays (ii) Pointers

Week 8

Write C programs that implement Queue (its operations) using

(i)Arrays (ii) Pointers

Week 9

Write a C program that uses Stack operations to perform the following:
(i) Converting infix expression into postfix expression
(ii) Evaluating the postfix expression

Week 10

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

Week 11

Write a C program that uses functions to perform the following operations on Doubly linkedlist.
i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 12

Write a C program that uses functions to perform the following operations on circular linkedlist.
i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 13

Write a C program that uses functions to perform the following:
i) Creating a Binary Tree of integers
ii) Traversing the above binary tree in preorder, inorder and postorder.

Week 14

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

Week 15

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

Text Books

1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.
2. B.A. Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016.
3. Richard F. Gilberg& Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011.

Reference Books:

1. PradipDey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2. E.Balaguruswamy, "C and Data Structures", 4th Edition, Tata Mc Graw Hill.
3. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.
4. M.T.Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.

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

Electrical & Electronics Engineering

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

I Year 1st 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):

Students should be able to

- Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources
- Understand flow and bio-geo- chemical cycles and ecological pyramids.
- Understand various causes of pollution and solid waste management and related preventive measures.
- About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
- Casus of population explosion, value education and welfare programmes

UNIT – I: Multidisciplinary Nature of Environmental Studies

Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II: Ecosystems, Biodiversity, and its Conservation

ECOSYSTEMS: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

BIODIVERSITY AND ITS CONSERVATION : Definition: 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 – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III: Environmental Pollution and Solid Waste Management

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution

e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT : Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV:	**Social Issues and the Environment**

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V:	**Human Population and the Environment**

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK : Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

TEXT BOOKS :

1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha 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 – Prentice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing 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 & Electronics Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Dept. of Electrical & Electronics Engineering					
I Year IInd Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Differential Equations & Vector Calculus	BS	3-0-0	3
2.		Chemistry	BS	3-0-0	3
3.		Data Structures	ES	3-0-0	3
4.		Basic Civil & Mechanical Engineering	ES	3-0-0	3
5.		Electrical & Electronics Engineering Workshop	ES	0-0-3	1.5
6.		Basic Engineering Workshop	ES	0-0-3	1.5
7.		Data Structures Lab	BS	0-0-3	1.5
8.		Chemistry Lab	ES	0-0-3	1.5
9.		Basic Civil & Mechanical Engineering Lab	ES	0-0-3	1.5
				Total	**19.5**

Category	**CREDITS**
Basic Science course	7.5
Engineering Science Courses	12
TOTAL CREDITS	**19.5**

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

Electrical & Electronics Engineering

Course Code	DIFFERENTIAL EQUATIONS&VECTOR CALCULUS (Common to ECE, EEE ,Civil & Mechanical Branches)	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 them into advanced level by handling various real world applications

Course Outcomes (CO):

- solve the differential equations related to various engineering fields
- Identify solution methods for partial differential equations that model physical processes
- interpret the physical meaning of different operators such as gradient, curl and divergence
- estimate the work done against a field, circulation and flux using vector calculus

UNIT - I	**Linear Differential Equations of Higher Order**

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.Simultaneous linear equations with constant coefficients, Applications: Mass spring system and L-C-R Circuit problems.

UNIT - II	**Partial Differential Equations – First order**

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order equations using Lagrange's methodand non-linear PDEs (Standard Forms).

UNIT - III	**Applications of Partial Differential Equations**

Classification of PDE, method of separation of variables for second order equations. Applications of Partial Differential Equations: One dimensional Wave equation, One dimensional Heat equation

UNIT - IV	**Multivariable Calculus (Vector differentiation)**

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

UNIT - V	**Multivariable Calculus (Vector integration)**

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (withoutproof), volume integral, Divergence theorem (without proof.

Textbooks:

1. 1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. 2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

Reference Books:

1. 1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. 2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. 3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. 4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
5. 5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
6. 6.T.K.VIyengar, B. Krishn Gandhi, S. Ranganatham and M.V.S.N. Prasad., S. chand Publishers.

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

Electrical & Electronics Engineering

Course Code	CHEMISTRY (Common CSE,ECE and EEE Branches)	L	T	P	C
		3	0	0	3

I Year 2nd Semester

Course Objectives:

- To familiarize engineering chemistry and its applications
- To train the students on the principle and applications of electrochemistry, polymers chemistry
- To introduce instrumental methods and advanced engineering materials

Course Outcomes (CO):

- **Demonstrate:** The materials of construction for battery and electrochemical series
- **Explain:** The preparation, properties, and applications of thermosetting and thermoplastics
- **Explain:** The constituents of Portland cement and factory affecting the refractory material
- **Explain:**Difference between the UV-Visible and IR spectroscopy
- **Discuss:** The setting and hardening of cement and concrete phase

UNIT - I	**Structure and Bonding Models:**	

Schrodinger wave equation (Eigen-value and Eigen-function). **Crystal field theory:** Crystal field theory and the energy level diagrams for transition metal ions, Salient features –splitting in octahedral and tetrahedral geometry**,** magnetic properties and colours.

UNIT - II	**Polymer Chemistry**	

Polymers: Basic concepts of polymerization, types of polymerization addition and condensation polymerization. **Plastomers:** thermosetting and theromoplastics composition properties and engineering applications of PVC, teflon, bakelite and nylons. **Rubber:** rubber-processing of natural rubber and Vulcanisation of rubber, compounds of rubber, elastomers-buna**S**, buna**N** preparation, properties and its applications. .

UNIT - III	**Electrochemistry and Fuel cells**	

Electrochemical cells: galvanic cells, types of electrodes (standard hydrogen, calomel and quinhydrone). **Batteries:** Nickel-cadmium, lithium ion batteries advantages, disadvantages and its applications. **Fuel cells:** Hydrogen-oxygen and methane-oxygen fuel cells advantages, disadvantages and its applications

UNIT - IV	**Advanced Engineering Materials**	

Building materials: Portland cement composition, classification, preparation (dry and wet processes).Constituents, phases and reactivity of clinker, Setting and hardening of cement. **Refractories:**Definition,criteries of refractories, Classification, properties, Factors affecting the refractory materials and applications. Failures of refractories.

UNIT - V	**Instrumental methods and Applications**	

Electromagnetic spectrum and absorption of radiations. The absorption laws: Beer-Lambert's law. principle, instrument ans its applications of UV-Visible and Infrared spectroscopy. Principle, instrumentation and its applications of pH metry.

Textbooks:

1. **1**.A text book of engineering chemistry., Jain and Jain, Dhanpat Rai Publishing Company., 15th edition, New Delhi,**2008**.
2. **2**. Chemistry of engineering. Prof. K.N. Jayaveera, Dr. G.V. Subba Reddy and Dr. C. Ramachandraiah. McGraw hill higher education. Hyderabad, 2009**.**
3. **3**. Peter Atkins, Julio de Paula and James Keeler, Atkin's Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. J.D Lee, Concise Inorganic Chemistry,5/e, OxfordUniversity Press,2008.
2. Skoog and West, Principles of instrumental Ananlysis, 6/e, Thomson, 2007.
3. .H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
4. Engineering chemistry 3e, B.Rama Devi et al., Cengage Learning.
5. Text book of Spectroscopy by Y.R. Sharma

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

Electrical & Electronics Engineering

Course Code	DATA STRUCTURES (Common to ECE and EEE)	L	T	P	C
		3	0	0	3

I Year 2nd Semester

Course Objectives:

- To teach the representation of solution to the problem using algorithm
- To explain the approach to algorithm analysis
- To introduce different data structures for solving the problems
- To demonstrate modelling of the given problem as a graph
- To elucidate the existing hashing techniques

Course Outcomes (CO):

Students should be able to

- Select Appropriate Data Structure for solving a real world problem
- Select appropriate file organization technique depending on the processing to be done
- Construct Indexes for Databases
- Analyse the Algorithms
- Develop Algorithm for Sorting large files of data

UNIT - I	

Introduction Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort

UNIT - II	

Stack, Queue and Linked lists Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.

UNIT - III	

Trees Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, Optimal Binary search Trees, AVL Trees. B-Trees: BTrees, B + Trees

UNIT - IV	

Graphs and Hashing The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

UNIT - V	

Files and Advanced sorting File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization. Advanced sorting: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.

Textbooks:
1. 1. Ellis Horowitz and SartajSahni, “Fundamentals of Data Structures in C”, 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004. 2. 2. Alan L. Tharp, “File Organization and Processing”, Wiley and Sons, 1988.
Reference Books:
1. 1. D. Samanta, “Classic Data Structures”, 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012. 3. Peter Bras, “Advanced Data Structures”, Cambridge University Press, 2016 2. 2. Richard F.Gilberg, Behrouz A.Forouzan, “Data Structures A Pseudo code Approach with C”, Second Edition, Cengage Learning 2005.

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

Electrical & Electronics Engineering

Course Code	BASIC CIVIL & MECHANICAL ENGINEERING	L	T	P	C
		3	0	0	3

I Year 2nd Semester

Course Objectives:

- Impart basic principles of stress, strain, shear force, bending moment and torsion.
- To teach principles of strain measurement using electrical strain gauges
- Describe technical details of power plants, gas turbines, hydro power plants and nonconventionalenergy sources.
- Teach different types of drives for power transmission
- Familiarize the sources of energy, power plant economics and environmental aspects.
- Outline the working components of different power plant.
- To teach working principle of hydraulic machinery.
- To familiarize the developments in IC engines.
- Explain the principles of refrigeration and air conditioning.

Course Outcomes (CO):

- Draw SFD and BMD for cantilever and simply supported beams.
- Understand the working principles of electrical resistors and capacitors.
- Apply concepts of Rosetta analysis for strain measurements
- Outline sources of energy, power plant economics, and environmental aspects.Describe working components of a steam power plant.
- Illustrate the working mechanism of Diesel and Gas turbine power plants.
- Explain different types of pumps and their application.
- Explain working of IC engines with combustion process.
- Possess the knowledge of system components of refrigeration and air conditioning

UNIT - I **Basic Definitions**

Basic Definitions of Force – Stress – Strain – Elasticity. Shear force – Bending Moment –Torsion. Simple problems on Shear force Diagram and Bending moment Diagram for cantileverand simply supported beams.

UNIT - II **Measurement of Strain**

Measurement of Strain - Electrical Capacitance and Resistance Strain gauges – multi channelstrain indicators. Rosette analysis – Rectangular and Triangular strain rosettes – Wheatstonebridge.

UNIT - III **Power Plant Engineering**

Introduction – Energy Renewable and Non – Renewable Energy,Sources – Classification of Power Plants based on Sources of Energy – Thermal Power Plant orSteam Power Plant – Hydro Electric Power – Nuclear Fission, Chain Reaction, Layout ofNuclear Power Plant – Diesel Power Plant – Gas Turbine Power Plant – Open Cycle GasTurbine, Closed Cycle Gas Turbine Power Plant, Comparison of Diesel Power Plant with GasTurbine Power Plant – Pumps – Classification of Pumps, Centrifugal Pump, Applications ofCentrifugal Pump, Priming, Reciprocating Pumps, Single Acting Reciprocating Pump, Workingof a Double acting Reciprocating Pump, Comparison of Reciprocating Pump with Centrifugal Pump –Hydraulic Turbine – Classification of Hydraulic Turbines, Impulse Turbine, ReactionTurbine, Difference between Impulse and Reaction Turbine.

UNT - IV **I.C Engine&Boilers**

I.C Engine: Heat Engine – Types of Heat Engine – External Combustion Engine, IC Engine (Internal Combustion), Classification of I.C. Engine, Two Stroke Petrol Engine, Four StrokeEngine, Valve Timing Diagram, Port Timing Diagram, Comparison of Two Stroke and FourStroke Engines, Comparison of Petrol Engine and Diesel Engine, Fuel System of a PetrolEngine, Ignition Systems.
Boilers: Classification of Boilers – Simple Vertical Boiler – Cochran Boiler – Babcock andWilcox Boiler – Benson Boiler – Difference between Fire Tube and Water Tube Boilers – BoilerMountings – Boiler Accessories – Difference between Boiler Mountings and Accessories.

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

Electrical & Electronics Engineering

UNIT-V	**Refrigeration and Air Conditioning**

Introduction – Terminology of Refrigeration and AirConditioning – Properties of Refrigerants – List of Commonly used Refrigerants – Types ofRefrigerating System – Vapour Compression System – Vapour AbsorptionRefrigerator – Domestic Refrigerator – Air Conditioning – Application of Air Conditioning – Psychrometry – Window Air Conditioning.

Textbooks:

1. Shanmugam G and Palanichamy M S, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi.
2. Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd.
3. Basic Civil and Mechanical Engineering, by Prof.V.Vijayan, Prof.M.Prabhakaran and Er.R.Viashnavi, S.Chand Publication.
4. Elements of Mechanical Engineering Fourth Edition S Trymbaka Murthy, UniversityPress.

References

1. S.Trymbaka Murthy., "Computer Aided Engineering Drawing" , Universities Press
2. Seetharaman S., "Basic Civil Engineering", Anuradha Agencies.
3. Venugopal K. and Prahu Raja V., "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam.
4. Er. R. Vaishnavi,Basic Civil and Mechanical Engineering, 2/e, S.Chand Publications.

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

Electrical & Electronics Engineering

Course Code	ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP	L	T	P	C
		3	0	0	3

I Year 2nd Semester

Course Objectives:

- To know about different tools, abbreviations and symbols in Electrical Engineering
- To learn about types of measuring instruments to measure electrical quantities
- To gain knowledge on different types of earthing and earth resistance
- To study different types of wiring

Course Outcomes (COs):

- Able to demonstrate knowledge on different tools, abbreviations and symbols used inElectrical Engineering.
- Able to measure different electrical quantities using measuring instruments
- Able to demonstrate how to trouble shoot the electrical equipment's (like fan, grinder, motor etc)
- Able to do wiring and earthing for residential houses

List of Experiments/Exercises

1. Familiarization of commonly used Electrical tools, symbols and abbreviations: Bread board, Tester, cables, cutters, switches, connectors, fuses, plier, screwdriver set, wire stripper, knife/blade etc.
   - Provide some exercises so that Electrical hardware tools and instruments are learned to be used by the students
2. Familiarization of types of sizes of wires and making "T" joint and straight joint for wires.
   - Provide some exercises on the wires so that the students can know the different sizes of wires and also know ow to join the wires.
3. Familiarization of Measuring the electrical quantities like Voltage, current, power and power factor in RLC circuit.
   - Provide some exercises so that electrical measuring instruments are learned to be used by the students
4. Familiarization of Measuring the electrical energy of single phase and three phase loads with energy meter
   - Providing some loads and exercising how to measure the electrical energy.
5. Familiarization on earthing and Measuringthe earth resistance.
   - Exercising on what is need of earthing and how to make an earthing.
6. Study and performance of residential wiring (using Energy meter, Fuses, Switches,Indicator, Lamps, etc.)
   - Exercising on how to make residential wiring using simple equipements.
7. Study of Fluorescent lamp wiring.
   - Understanding the working of Fluorescent lamp wiring.
8. Study of various electrical gadgets (CFL and LED).
   - Familiarization on various electrical gadgets.
9. Study of PV Cell
   - Understanding the working of solar PV cell.
10. Study of Induction motor and Transformer
    - To making understand to student to know the working of Induction motor and Transformer.
11. Assembly of choke or small transformer.
    - Exercising on assembling on choke coil.
12. Study of trouble shooting of electrical equipments (fan, iron box, mixer-grinder, etc.)
    - Exercising on trouble shooting of various electrical equipements.
13. Introduction to basics of Electronic components: Solder practice, Multi meter, Powersupply.
    - Provide some exercises so that electronics hardware tools and instruments are learned to be used by the students.
14. Measurement of wire guages using guage meter
    - Exercising on Measurement of wire guages using guage meter
15. Identification of color code, resistors, ICs, Transistors, capacitors, diodes, SCRs, IGBTs etc.
    - Exercising the student on Identification of various electrical and semiconductor elements.

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

Electrical & Electronics Engineering

Course Code	BASIC ENGINEERING WORKSHOP	L	T	P	C
		0	0	3	1.5
I Year 2nd Semester					

Course Objectives:

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

Course Outcomes (CO):

- Apply wood working skills in real world applications.
- Build different parts with metal sheets in real world applications.
- Apply fitting operations in various applications.
- Apply different types of basic electric circuit connections.
- Demonstrate soldering and brazing.

List of Experiments/Exercises

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

a) 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:

Familiarities 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

Design and analysis aspects of thecircuit.

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

Electrical & Electronics Engineering

Course Code	DATA STRUCTURES LAB (Common to All Branches of Engineering)	L	T	P	C
		0	0	3	1.5

I Year 2nd Semester

Course Objectives:

- To introduce to the different data structures
- To elucidate how the data structure selection influences the algorithm complexity
- To explain the different operations that can be performed on different data structures
- To introduce to the different search and sorting algorithms.

Course Outcomes (CO):

At the end of the course students should be able to

- Select the data structure appropriate for solving the problem
- Implement searching and sorting algorithms
- Design new data types
- Illustrate the working of stack and queue
- Organize the data in the form of files

List of Experiments:

1. String operations using array of pointers
2. Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
3. Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.
4. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
5. Stack implementation using arrays
6. Stack implementation using linked lists
7. Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank.
8. Queue implementation using linked lists
9. Creation of binary search tree, performing operations insertion, deletion, and traversal.
10. Breadth first search
11. Depth first search
12. Travelling sales man problem
13. File operations
14. Indexing of a file
15. Reversing the links (not just displaying) of a linked list.
16. Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using ‘Ladies first’ principle. You may create new linked lists if necessary.
17. An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.
18. A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table datatype and support different operations on it.

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

Electrical & Electronics Engineering

Course Code	CHEMISTRY LAB (Common CSE,ECE and EEE Branches)	L	T	P	C
		0	0	3	1.5

I Year 2nd Semester

Course Objectives:

- Verify the fundamental concepts with experiment

Course Outcomes (CO):

- **Determination:** Hardness of water by using EDTA
- **Estimation:** Amount of dissolved oxygen given water sample
- **Analysis:** Difference between the UV-Visible and IR spectroscopy
- **Explain:** Verification of Beer-Lambert's law
- **Identify:** Acid -base buffer solution pH meter

List of Experiments

Chemical methods: Volumetric analysis

1. Estimation of Ferrous (Fe^{2+}) Ion using Standard Potassium Dichromate

Iodometry Titrations:

2.Estimation of Copper (Cu^{2+}) Ion using Standard Potassium Dichromate

(i) Part-I : Standardization of sodium thiosulphate ($Na_2S_2O_3$) solution with standard $K_2Cr_2O_7$

(ii) Part-II: Estimation of Copper

Complexometry Titrations:

3.Estimation of Calcium hardness of water using Standard EDTA solution

4.Estimation of Copper by using Standard EDTA solution

5.Dissolved Oxygen: To test the amount of dissolved oxygen present in the given water sample.

Physical methods: Instrumental Analysis

6. pH metric titration of (i) strong acid vs strong base, (ii) weak acid vs strong base

7. Determination of cell constant and conductance of solutions

8. Determination of colorimetric titration with $KMnO_4$ solution

9. Verification of Beer-Lambert's law with $K_2Cr_2O_7$ solution.

10.Viscosity determination of Kerosin and Petrol by Red-wood viscometer

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

Electrical & Electronics Engineering

Course Code	BASIC CIVIL & MECHANICAL ENGINEERING LAB	L	T	P	C
		0	0	3	1.5

I Year 2nd Semester

Course Objectives:

- Impart basic principles of stress, strain, shear force, bending moment and torsion.
- To teach principles of strain measurement using electrical strain gauges
- Describe technical details of power plants, gas turbines, hydro power plants and nonconventional energy sources.
- Teach different types of drives for power transmission
- Familiarize the sources of energy, power plant economics and environmental aspects.
- Outline the working components of different power plant.
- To teach working principle of hydraulic machinery.
- To familiarize the developments in IC engines.
- Explain the principles of refrigeration and air conditioning.

Course Outcomes (CO):

Upon the successful completion of course, students will be able to

- Conducting bending tests on Cantilever beam and simply supported beam.
- Finding the Use of electrical resistance strain gauges
- Conducting Compression test and Water absorption test on Bricks
- Explain different working cycles of engine.
- Illustrate the working of refrigeration systems
- Evaluate heat balance sheet of IC engine.

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Bending test on (Steel/Wood) Cantilever beam.
2. Bending test on (Steel/Wood) simply supported beam.
3. Use of electrical resistance strain gauges.
4. Compression test on Bricks
5. Water absorption test on Bricks
6. Torsion test.
7. Tests on closed coiled and open coiled helical springs

Basic Mechanical Engineering Laboratory Experiments

1. Load test on four stroke Diesel Engine with mechanical loading.
2. Load test on four stroke Diesel Engine with DC Generator loading.
3. Heat balance test on Four Stroke Diesel Engine.
4. Load test on two stroke petrol engine.
5. A) Study of Valve & Port diagram. B) Study of boilers.
6. Performance test on vapour compression refrigeration system.
7. Performance test on vapour absorption refrigeration system.

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 & Electronics Engineering					
II Year I Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Complex Variables & Transforms	BS	3-0-0	3
2.		DC Circuits	PC	3-0-0	3
3.		DC Machines &Transformers	PC	3-0-0	3
4.		Electronic Devices and Circuits	PC	3-0-0	3
5.		Managerial Economics and Financial Analysis	HS	3-0-0	3
6.		Electronic Devices and Circuits Lab	PC	0-0-3	1.5
7.		DC Machines and Transformers Lab	PC	0-0-3	1.5
8.		DC Circuits Lab	PC	0-0-3	1.5
9.		**Skill oriented course – I** Application Development with Python	SC	1-0-2	2
10.		**NCC/NSS ACTIVITIES**			
				Total	**21.5**

Category	**CREDITS**
Basic Science course	3
Professional Core Courses	13.5
Humanities and Social science	3
Skill oriented course	2
TOTAL CREDITS	**21.5**

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

Electrical & Electronics Engineering

Course Code	Complex variables and Transforms (Common to ECE & EEE)	L	T	P	C
		3	0	0	3
II Year 1st Semester					

Course Objectives:

This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables. The student develops the idea of using continuous/discrete transforms.

Course Outcomes (CO): Student will be able to

- Understand the analyticity of complex functions and conformal mappings.
- Apply Cauchy's integral formula and cauchy's integral theorem to evaluate improper integrals along contours.
- Understand the usage of laplace transforms, Fourier transforms and z transforms.
- Evaluate the Fourier series expansion of periodic functions.
- Understand the use of Fourier transforms and apply z transforms to solve difference equations.

UNIT - I **Complex Variable – Differentiation**:

Introductiontofunctionsofcomplexvariable-conceptofLimit&continuity-Differentiation, Cauchy- Riemann equations, analytic functions (exponential, trigonometric, logarithm), harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method-Conformal mappings-standard and special transformations (sin z, e^z, cos z, z^2) Mobius transformations (bilinear) and their properties.

UNIT - II **Complex Variable – Integration**:

Line integral-Contour integration, Cauchy's integral theorem, Cauchy Integral formula, Liouville's theorem (without proof) and Maximum-Modulus theorem (without proof);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, Evaluation of certain improper integrals (around unit circle, semi circle with f(z) not having poles on real axis).

UNIT - III **Laplace Transforms**

Definition-Laplace transform of standard functions-existence of Laplace Transform – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function. Differentiation and integration of transform – solving Initial value problems to ordinary differential equations with constant coefficients using Laplace transforms.

UNIT - IV **Fourier series**

DeterminationofFouriercoefficients(Euler's)–DirichletconditionsfortheexistenceofFourierseries – functions having discontinuity-Fourier series of Even and odd functions – Fourier series in an arbitrary interval – Half-range Fourier sine and cosine expansions- typical wave forms - Parseval's formula-Complex form of Fourier series.

UNIT - V **Fourier transforms & Z Transforms:**

Fourier integral theorem (without proof) – Fourier sine and cosine integrals-complex form of Fourier integral. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – convolution theorem .

Z-transform–Inversez-transform–Properties–Dampingrule–Shiftingrule–Initialandfinalvalue theorems. Convolution theorem – Solution of difference equations byz-transforms.

Textbooks:
1. Higher Engineering Mathematics, B.S.Grewal, Khannapublishers. 2. Advanced Engineering Mathematics, by Erwin Kreyszig, WileyIndia
Reference Books:
1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hillpublishers. 2. Advanced Engineering Mathematics, by Alan Jeffrey,Elsevier.
Online Learning Resources:
1. nptel.ac.in/courses/111107056 2. onlinelibrary.wiley.com 3. https://onlinecourses.nptel.ac.in/noc18ma12.

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

Electrical & Electronics Engineering

Course Code	DCCIRCUITS	L	T	P	C
		3	0	0	3

II Year 1st Semester

Course Objectives:

To make the student learn about

- Basic characteristics of R,L,C parameters, their Voltage and Current Relations and Various combinations of these parameters.
- Kirchhoff's Laws to solve for DC networks
- Node analysis with dependent and independent sources
- To understand basic graph theory
- To analyze the Superposition, Thevinin's, Nortons, Maximum power transfer, Tellegen's, Milliman's and compensation theorems for DCexcitations

Course Outcomes (CO):

CO1: To know about RLC parameters DC networks, voltage source to current source and vice- versa transformation in their representation and voltage current relationship for passive elements.

CO2: Analyze Kirchhoff's laws for DC circuits analysis of series and parallel circuits convert star-to-delta or delta-to-star transformation between balanced and unbalanced circuits and To know current division, voltage division.

CO3: To understand Mesh analysis, super mesh analysis and to know Nodal and Super node analysis with dependent and independent sources.

CO4: To understand basic Magnetic circuits, Faradays laws of electromagnetic induction Concept of self and mutual inductance- Dot connection Co-efficient ofcoupling-compositemagneticcircuits-analysisofseriesandparallel magnetic circuits.

CO5: To analyse Superposition, Thevinin's, Nortons, Maximum power transfer, Tellegen's, millimans and compensation theorems for DC excitations, Duality and dual networks, Graph-Tree, Basic cut set and basic Tie set matrices for planar networks.

UNIT - I	**Introduction to Electrical Circuits**

Circuit concept R-L-C parameters- voltage and current sources- Independent and dependent sources - Source transformation-voltage current relationship for passive elements.

UNIT - II	**Kirchoff's Laws**

Kirchoff's laws-network reduction techniques-series, parallel, star-to-delta or delta-to-star transformation, current division, voltage division.

UNIT - III	**Methods of Analyzing Circuits**

Mesh analysis, super mesh analysis, Nodal analysis, Super node analysis with dependent and independent sources.

UNIT - IV	**Magnetic Circuits**

Magneticcircuits–Faradayslawsofelectromagneticinduction-Conceptofselfandmutualinductance- Dot connection- Co-efficient of coupling- composite magnetic circuits- analysis of series and parallel magnetic circuits.

UNIT - V	**Network Theorems for DC Excitation**

Superposition, Thevinin's, Norton, Maximum power transfer, Tellegen's, millimans and compensation theorems for DCexcitations, Duality and dual networks.

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

Textbooks:

1. FundamentalsofElectricCircuitsCharlesK.AlexanderandMatthew.N.O.Sadiku,Mc GrawHill, 5th Edition, 2013.
2. CircuitTheory(Analysis&Synthesis)A.Chakrabarti,DhanpatRai&Sons,7th Revised Edition, 2018.

Reference Books:

1. Engineering circuit analysis William Hayt and Jack.E.Kemmerly, McGraw Hill Company, 7th Edition, 2006.
2. Network Analysis M.E Van Valkenberg, PrenticeHall(India),3rdEdition,1999.
3. Electrical Engineering Fundamentals V.Del Toro, Prentice Hall International,2 nd Edition,2019.
4. ElectricCircuits-Schaum'sSeries,McGrawHill,5th Edition,2010.
5. Electrical Circuit Theory and Technology John Bird, Routledge, Taylor & Francis, 5th Edition,2014.

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:

- 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):

CO1: Able to understand the construction, operation and armature windings of a DC generator, the characteristics of DC generators, parallel operation of generators.

CO2: To know the principle of operation of DC motors, Understanding the speed controlling methods, Starting of DC motors.

CO3: To know the various losses in a DC machines, Finding the efficiency in DC machines, Understanding the performance of DC machine by various testing's

CO4: Principle of operation of single phase transformers, Drawing phasor diagrams, Know the performance of transformer by various testing's, To know the parallel operation of transformer and Operating principle and construction of auto transformer.

CO5: To know the construction and principle of operation of three phase transformers and the tap changing methods of three phase transformers.

UNIT - I	**DC Generators**

Constructional details of DC machine, principle of operation of DC generator, armature windings and its types, emf equation, armature reaction, demagnetizing and cross magnetizing ampere turns, compensating windings, commutation, methods of improving commutation, OCC and load characteristics of different types of generators. Parallel operation of DC Generators: DC shunt and series generators in parallel, equalizing connections.

UNIT - II	**DC Motors**

Principle of operation, back emf ,types of DC motors, Torque and power developed byarmature,speedcontrolofDCmotors(ArmaturecontrolandFluxcontrolmethods),Necessityof starters, constructional details of 3-point and 4-point starters, characteristics of DC motors.

UNIT - III	**Losses-Efficiency and Testing of DC Motors**

Losses in DC machines, efficiency, condition for maximum efficiency, Brake test, Swinburne's test, Hopkinson's test, Fields test, Retardation test.

UNIT - IV	**Single Phase Transformers**

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagrams(no load and on load), Magnetizing current, losses and efficiency Testing - open circuit and short circuit tests, voltage regulation, Sumpner's test, separation of hysteresis and eddy current losses.Paralleloperationofsingle-phasetransformers,Autotransformers-construction,principle,applicationsand comparison with two winding transformer.

UNIT - V	**Three Phase Transformers**

Three-phase transformer – construction, types of connection and their comparative features, Phase conversion - Scott connection, Tap-changing transformers - No-load and on-load tap changing of transformers, Three-winding transformers using constant current source, Common Source Amplifier using MOSFETs – Small signal analysis and design, Body Effect, Problem Solving

Textbooks:

1. P.S.Bimbhra,“ElectricalMachinery”,KhannaPublishers,2011.
2. I.J.NagrathandD.P.Kothari,“ElectricMachines”,McGrawHillEducation,2010.

Reference Books:

1. A.E.FitzgeraldandC.Kingsley,"ElectricMachinery”,NewYork,McGrawHillEducation,2013.
2. A.E.ClaytonandN.N.Hancock,“PerformanceanddesignofDCmachines”,CBSPublishers,2004.
3. M.G.Say,“PerformanceanddesignofACmachines”,CBSPublishers,2002.

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

Electrical & Electronics Engineering

Course Code	ELECTRONIC DEVICES & CIRCUITS	L	T	P	C
		3	0	0	3
II Year 1st Semester					

Course Objectives:

- To acquire fundamental knowledge and expose to the field of semiconductor theory and devices and their applications.
- To introduce different types of semiconductor devices, viz., diodes and special diodes.
- To explain application of diodes as rectifiers, clippers, clampers and regulators.
- To describe operation and characteristics of Bipolar Junction Transistor& Field Effect Transistor.
- To analyze the various biasing circuits using BJTs & FETs.

Course Outcomes (CO):

- To understand the basic principles of all semiconductor devices.
- To be able to solve problems related to diode circuits, and amplifier circuits.
- To analyze diode circuits, various biasing and small signal equivalent circuits of amplifiers.
- To be able to compare the performance of BJTs and MOSFETs
- To design rectifier circuits and various amplifier circuits using BJTs and MOSFETs.

UNIT - I	**Semiconductor Diodes**

Open circuited PN junction, PN junction as a rectifier, Current components in a PN diode, Diode Equation and its mathematical derivation, Volt-Ampere Characteristics, Energy band diagram of PN diode, Temperature dependence of Volt-Ampere Characteristics, Diode resistance (Static and Dynamic resistance), Transition capacitance, Diffusion capacitance, Step graded junction.

UNIT - II	**Special Devices**

Avalanche breakdown, V-I Characteristics of Zener diode, Zener breakdown, Principle of operation and characteristics of Tunnel diode with the help of Energy band diagram, Photo diode, LED, PIN diode and Varactor diode, Silicon Controlled Rectifier (SCR) and its V-I characteristics, DIAC, TRIAC, Schottky Barrier diode, solar cell, Uni-Junction Transistor (UJT)and its V-I Characteristics ,Problem solving

UNIT - III	**Diode Applications**

Diode as switch, Rectifier – Half wave and Full wave rectifier, Bridge rectifier, Ripple factor, PIV, Filters – Inductor and Capacitor Filter, L-section filter, pi-Filter, Zener as voltage regulator, Clipping and Clamping circuits,Detector,Voltage doubler, Problem solving related to diode applications.

UNIT - IV	**Bipolar Junction Transistor(BJT)**

Transistor – Structure, current components and their relationship, PNP and NPN transistors- Active mode of operation, symbols and conventions, Transistor equations, Transistor as an amplifier, input and output characteristics of Common Base, Common Emitter and Common collector configurations. DC analyses of Common Base, Common Emitter and Common collector circuits.

BJT Biasing: Load line and modes of operations, operating point, Bias stability, fixed bias, self-bias, stabilization against variations in I_{co}, V_{BE}, β, Bias compensation, Thermal runaway, condition for Thermal stability, Problem solving.

Applications: As a switch, as an amplifier.

UNIT - V	**Field-Effect Transistors (FET)**

Metal Oxide Semiconductor Field-effect Transistor (MOSFET) -structuresandV-Icharacteristicsofn-channelEnhancementmodeMOSFET,p-channelEnhancementmodeMOSFET,n-channeldepletionmodeMOSFET,p-channeldepletionmodeMOSFET, symbols and conventions, Complementary MOSFETs(CMOSFETs)-structure, V-I characteristics, symbols and conventions, structure and V-I characteristics of n- channel and p-channel Junction Field Effect Transistors(JFET),Problem solving.

Textbooks:

1. Donald A Neamen,"Electronic Circuits–analysis and design", 3rdEdition, McGraw Hill (India),2019.
2. J.Milliman andCHalkias,"Integratedelectronics",2ndEdition,TataMcGrawHill,1991.

Reference Books:

1. Behzad Razavi,"Microelectronics",2ndedition,Wiley,2013.
2. R.L.Boylestad and Louis Nashelsky, "Electronic Devices and Circuits," 9thEdition, Pearson,2006.
3. Jimmie J Cathey,"ElectronicDevicesandCircuits,"Schaum'soutlinesseries,3rd

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
		3	0	0	3

II Year 1st Semester

Course Objectives:

- To inculcate the basic knowledge of micro economics and financial accounting
- To make the students learn how demand is estimated for different products
- To know the input- output relationship for optimizing production and cost
- To give an overview on investment appraisal methods to promote the students to learn howto plan long-term investment decisions.
- To provide fundamental skills on Accounting and to explain the process of preparing Financial statements

Course Outcomes (CO):

- Understand the fundamentals of Economics viz., Demand, Production, cost andrevenue
- Apply concepts of production , cost and revenues for effective business decisions
- Students can analyze how to invest their capital and maximize returns
- Evaluate the capital budgeting techniques
- Prepare the accounting statements and evaluate the financial performance of business entity.

UNIT - I	**Introduction To Managerial Economics**

Introduction to Economics and Managerial Economics – Definitions-Nature and Scope of Managerial Economics–Demand Analysis- Demand determinants- Law of Demand – Exceptions of law of demand

UNIT - II	**Elasticity And Forecasting Demand**

Elasticity of Demand- Definition-Types-Measurement - Significance of Elasticity of Demand Demand Forecasting- Factors governing demand forecasting- Methods of demand forecasting (survey methods-statistical methods- expert opinion method- test marketing- controlled experiments-judgmental approach to demand forecasting).

UNIT - III	**Theory Of Production And Cost Analysis**

Production Function – Iso-quants- Iso-costs - MRTS- least cost combination of inputs- Cobb-Douglas production function -laws of returns - Internal and External economies of scale. Cost concepts-opportunity cost- fixed Vs variable costs-explicit costs Vs Implicit costs- out of pocket costs Vs Imputed costs- Break-Even Analysis (BEA)- Determination of Break Even Point -Simple Problems- Managerial significance and limitations of BEA.

UNIT - IV	**Forms Of Business Organizations And New EconomicEnvironment**

Business & New Economic Environment- Forms of business organizations-Factors affecting the choice of form of business organization- Features and evaluation of Sole Proprietorship- Partnership-Joint Stock Company- Public Enterprises and their types- Liberalization- Privatization-Globalization - Changing Business Environment in Post-liberalization scenario.

UNIT - V	**Capital Budgeting And Financial Accounting**

Concept of Capital - Significance - Types of Capital - Components of Working Capital - Sources of Short-term and Long-term Capital - Estimating Working capital requirements – Cash Budget - Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects : Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) method (simple problems)-Introduction to Financial Accounting-Double-Entry Book Keeping- preparation of Journal- Ledger-Trial Balance- Final Accounts (Trading & Profit and Loss Account and Balance Sheet with simple adjustments).

Textbooks:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

Reference Books:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
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, 2013.

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	ELETCRONIC DEVICES AND CIRCUITS LAB	L	T	P	C
		0	0	3	1.5

II Year 1st Semester

Course Objectives:

- To verify the theoretical concepts practically from all the experiments.
- To analyse the characteristics of Diodes, BJT, MOSFET,UJT.
- To design the amplifier circuits from the given specifications.
- To Model the electronic circuits using tools such as PSPICE/Multisim.

Course Outcomes (CO):

- Understand the basic characteristics and applications of basic electronic devices.
- Observe the characteristics of electronic devices by plotting graphs.
- Analyze the Characteristics of UJT, BJT, MOSFET.
- Design MOSFET / BJT based amplifiers for the given specifications.
  Simulate all circuits in PSPICE /Multisim.

Experiments (Execute any 12 experiments)

1. Verification of Volt- Ampere characteristics of a PN junction diode and find static, dynamic and reverse resistances of the diode from the graphs obtained.
2. Design a full wave rectifier for the given specifications with and without filters, and verify the given specifications experimentally. Vary the load and find ripple factor. Draw suitable graphs.
3. Verify various clipping and clamper circuits using PN junction diode and draw the suitable graphs.
4. Design a Zener diode-based ***voltage regulator*** against variations of supply and load. Verify the same from the experiment.
5. Study and draw the ***output*** and ***transfer*** characteristics of MOSFET (Enhance mode) in Common Source Configuration experimentally. Find ***Threshold voltage (V_T), g_m, &K*** from thegraphs.
6. Study and draw the ***output*** and ***transfer*** characteristics of MOSFET (Depletion mode) or JFETinCommonSourceConfigurationexperimentally.FindI_{DSS},g_m,&$V_P$fromthegraphs.
7. Verification of the input and output characteristics of BJT in **Common Emitter** configuration experimentally and find required ***h – parameters*** from the graphs.
8. Study and draw the input and output characteristics of BJT in **Common Base** configuration experimentally, and determine required ***h – parameters*** from the graphs.
9. Study and draw the Volt Ampere characteristics of UJT and determine ***η,I_P, I_v, V_P, &Vv*** from the experiment.
10. Design and analysis of voltage- divider bias/self-bias circuit using BJT.
11. Design and analysis of voltage- divider bias/self-bias circuit using JFET.
12. Design and analysis of self-bias circuit using MOSFET.
13. Design a suitable circuit for switch using CMOS FET/JFET/BJT.
14. Design a small signal amplifier using MOSFET (common source) for the given specifications. Draw the frequency response and find the band width.
15. Design a small signal amplifier using BJT (common emitter) for the given specifications. Draw the frequency response and find the band width.

Tools / Equipment Required: Software Too llike Multisim/ Pspice or Equivalent, DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

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

Electrical & Electronics Engineering

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

II Year 1st Semester

Course Objectives:

- To find OCC characteristics of DC generator and also finding critical resistance and critical speed.
- To draw the performance characteristics of DC motor and finding the efficiency.
- To analyze the speed controlling methods.
- To find the efficiency of single phase transformer.
- To verify the parallel operation of single phase transformers.

Course Outcomes (CO):

CO1: Understand the OCC characteristics of DC generator
CO2: Conduct the experiment and draw the characteristics of DC motor.
CO3: Analyze efficiency of single phase transformer.
CO4: Understandthe parallel operation of single phase transformers.

List of Experiments:

1. Magnetization characteristics of DC shunt generator. Determination of critical field Resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Brake test on DC shunt motor. Determination of performance curves.
4. Brake test on DC series motor.
5. Brake test on DC compound motor.
6. Swinburne's tests on DC shunt motor, Predetermination of efficiency.
7. Speed control of DC shunt motor (Armature control and Field control method).
8. Retardation test on D.C. Shunt Machine
9. Field's Test on a pair of Similar DC series Machines
10. Hopkinson's tests on DC shunt machines. Predetermination of efficiency.
11. OC and SC test on single phase transformer
12. Parallel operation of single phase transformers.
13. Sumpner's test on single phase transformers.
14. Scott connection of single phase transformers
15. Separation of losses of single phase transformer.

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

Electrical & Electronics Engineering

Course Code	DC CIRCUITS LAB	L	T	P	C
		0	0	3	1.5

II Year 1st Semester

Course Objectives:

- To the various theorems and comparing with theoretical values.
- Determining the various parameters like Z, Y, Transmission and Hybride.
- To analyze the co-efficient of coupling.

Course Outcomes (CO):

CO1: Understand the various theorems.
CO2: Analyzing the different electrical parameters.
CO3: Analyze co-efficient of coupling.

List of Experiments:

1. Verification of KCL and KCL
2. Verification of mesh analysis
3. Verification of nodal analysis
4. Verification of superposition theorem
5. Verification of reciprocity theorem
6. Verification of maximum power transfer theorem.
7. Verification of Thevenin's theorem
8. Verification of Norton's theorem
9. Verification of milliman's theorem
10. Verification of compensation theorem
11. Verification of Tellegen's, theorem
12. Determination of Z Parameters
13. Determination of Y Parameters
14. Determination of Transmission Parameters
15. Determination of Hybrid Parameters
16. Determination of Coefficient of coupling

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

Electrical & Electronics Engineering

Course Code	APPLICATION DEVELOPMENT WITH PYTHON	L	T	P	C
		1	0	2	2
II Year 1st Semester					

Course Objectives:

- To learn the basic concepts of software engineering and life cycle models
- To explore the importance of Databases in application Development
- Acquire programming skills in core Python
- To understand the importance of Object-oriented Programming

Course Outcomes (CO):

Students should be able to

- Identify the issues in software requirements specification and enable to write SRS documents for software development problems
- Explore the use of Object oriented concepts to solve Real-life problems
- Design database for any real-world problem
- Solve mathematical problems using Python programming language

Module 1. Basic concepts in software engineering and software project management

Basic concepts: abstraction versus decomposition, the evolution of software engineering techniques, Software development life cycle
Software project management: project planning and project scheduling

Task:
1. Identifying the Requirements from Problem Statements

Module 2. Basic Concepts of Databases
Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Data Definition Language(DDL) Statements: (Create table, Alter table, Drop table), Data Manipulation Language(DML) Statements
Task:
1. Implement Data Definition Language(DDL) Statements: (Create table, Alter table, Drop table)
2. Implement Data Manipulation Language(DML) Statements

Module 3. Python Programming:
Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements, Looping statements
Python Data Structures: Lists, Dictionaries, Tuples.

Strings: Creating strings and basic operations on strings, string testing methods.

Functions: Defining a function- Calling a function- Types of functions-Function Arguments- Anonymous functions- Global and local variables

OOPS Concepts; Classes and objects- Attributes- Inheritance- Overloading- Overriding- Data hiding

Modules and Packages: Standard modules-Importing own module as well as external modules Understanding Packages Powerful Lamda function in python Programming using functions, modulesand external packages

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

Electrical & Electronics Engineering

Working with Data in Python: Printing on screen- Reading data from keyboard- Opening and closing file- Reading and writing files- Functions-Loading Data with Pandas-Numpy

Tasks:

1. OPERATORS

a. Read a list of numbers and write a program to check whether a particular element is present or not using membership operators.
b. Read your name and age and write a program to display the year in which you will turn 100 years old.
c. Read radius and height of a cone and write a program to find the volume of a cone.
d. Write a program to compute distance between two points taking input from the user (Hint: use Pythagorean theorem)

2. CONTROL STRUCTURES

a. Read your email id and write a program to display the no of vowels, consonants, digits and white spaces in it using if…elif…else statement.
b. Write a program to create and display a dictionary by storing the antonyms of words. Find the antonym of a particular word given by the user from the dictionary using while loop.
c. Write a Program to find the sum of a Series 1/1! + 2/2! + 3/3! + 4/4! +…….+ n/n!. (Input :n = 5, Output : 2.70833)
d. In number theory, an abundant number or excessive number is a number for which the sum of its proper divisors is greater than the number itself. Write a program to find out, if the given number is abundant. (Input: 12, Sum of divisors of 12 = 1 + 2 + 3 + 4 + 6 = 16, sum of divisors 16 > original number 12)

3: LIST

a. Read a list of numbers and print the numbers divisible by x but not by y (Assume x = 4 and y = 5).
b. Read a list of numbers and print the sum of odd integers and even integers from the list.(Ex: [23, 10, 15, 14, 63], odd numbers sum = 101, even numbers sum = 24)
c. Read a list of numbers and print numbers present in odd index position. (Ex: [10, 25, 30, 47, 56, 84, 96], The numbers in odd index position: 25 47 84).
d. Read a list of numbers and remove the duplicate numbers from it. (Ex: Enter a list with duplicate elements: 10 20 40 10 50 30 20 10 80, The unique list is: [10, 20, 30, 40, 50, 80])

4: TUPLE

a. Given a list of tuples. Write a program to find tuples which have all elements divisible by K from a list of tuples. test_list = [(6, 24, 12), (60, 12, 6), (12, 18, 21)], K = 6, Output : [(6, 24, 12), (60, 12, 6)]
b. Given a list of tuples. Write a program to filter all uppercase characters tuples from given list of tuples. (Input: test_list = [(“GFG”, “IS”, “BEST”), (“GFg”, “AVERAGE”), (“GfG”,), (“Gfg”, “CS”)],Output : [(„GFG“, „IS“, „BEST“)]).
c. Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input : tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output : 3)

5: SET

a. Write a program to generate and print a dictionary that contains a number (between 1 and n) in the form (x, x*x).
b. Write a program to perform union, intersection and difference using Set A and Set B.
c. Write a program to count number of vowels using sets in given string (Input : “Hello World”, Output: No. of vowels : 3)
d. Write a program to form concatenated string by taking uncommon characters from two strings using set concept (Input : S1 = "aacdb", S2 = "gafd", Output : "cbgf").

6: DICTIONARY

a. Write a program to do the following operations:
i. Create a empty dictionary with dict() method
ii. Add elements one at a time
iii. Update existing key‟s value
iv. Access an element using a key and also get() method
v. Deleting a key value using del() method
b. Write a program to create a dictionary and apply the following methods:
i. pop() method
ii. popitem() method
iii. clear() method
c. Given a dictionary, write a program to find the sum of all items in the dictionary.
d. Write a program to merge two dictionaries using update() method.

7: STRINGS

a. Given a string, write a program to check if the string is symmetrical and palindrome or not. A stringis said to be symmetrical if both the halves of the string are the same and a string is said to be a palindrome string if one half of the string is the reverse of the other half or if a string appears same when read forward or backward.
b. Write a program to read a string and count the number of vowel letters and print all letters except 'e'and 's'.
c. Write a program to read a line of text and remove the initial word from given text. (Hint: Use split() method, Input : India is my country. Output : is my country)
d. Write a program to read a string and count how many times each letter appears. (Histogram).

8: USER DEFINED FUNCTIONS

a. A generator is a function that produces a sequence of results instead of a single value. Write a generator function for Fibonacci numbers up to n.
b. Write a function merge_dict(dict1, dict2) to merge two Python dictionaries.
c. Write a fact() function to compute the factorial of a given positive number.
d. Given a list of n elements, write a linear_search() function to search a given element x in a list.

9: BUILT-IN FUNCTIONS

a. Write a program to demonstrate the working of built-in statistical functions mean(), mode(), median() by importing statistics library.
b. Write a program to demonstrate the working of built-in trignometric functions sin(), cos(), tan(), hypot(), degrees(), radians() by importing math module.
c. Write a program to demonstrate the working of built-in Logarithmic and Power functions exp(), log(), log2(), log10(), pow() by importing math module.
d. Write a program to demonstrate the working of built-in numeric functions ceil(), floor(), fabs(), factorial(), gcd() by importing math module.

10. CLASS AND OBJECTS

a. Write a program to create a BankAccount class. Your class should support the following methods for
i) Deposit
ii) Withdraw
iii) GetBalanace
iv) PinChange
b. Create a SavingsAccount class that behaves just like a BankAccount, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint:use Inheritance).

c. Write a program to create an employee class and store the employee name, id, age, and salary usingthe constructor. Display the employee details by invoking employee_info() method and also using dictionary (dict).
d. Access modifiers in Python are used to modify the default scope of variables. Write a program to demonstrate the 3 types of access modifiers: public, private and protected.

11. FILE HANDLING

a. . Write a program to read a filename from the user, open the file (say firstFile.txt) and then perform the following operations:
   i. Count the sentences in the file.
   ii. Count the words in the file.
   iii. Count the characters in the file.

b. . Create a new file (Hello.txt) and copy the text to other file called target.txt. The target.txt file should store only lower case alphabets and display the number of lines copied.
c. Write a Python program to store N student‟s records containing name, roll number and branch. Print the given branch student‟s details only.

References:

1. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHI, 2018.
2. RamezElmasri, Shamkant, B. Navathe, “Database Systems”, Pearson Education, 6th Edition, 2013.
3.Reema Thareja, “Python Programming - Using Problem Solving Approach”, Oxford Press, 1st Edition, 2017.
4. Larry Lutz, “Python for Beginners: Step-By-Step Guide to Learning Python Programming”, CreateSpace Independent Publishing Platform, First edition, 2018

Online Learning Resources/Virtual Labs:

1. http://vlabs.iitkgp.ernet.in/se/
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php
3. https://python-iitk.vlabs.ac.in

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 Electronics & Communication Engineering					
II Year II Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1.		Numerical Methods & Probability Theory	BS	3-0-0	3
2.		AC Circuits	PC	3-0-0	3
3.		AC Machines	PC	3-0-0	3
4.		Engineering Electromagnetics	PC	3-0-0	3
5.		Digital Electronics and Logic Design	ES	3-0-0	3
6		UHV-II: Universal Human Values – Understanding harmony and Ethical Human Conduct	HS	2-1-0	3
7.		AC Machines Lab	PC	0-0-3	1.5
8.		AC Circuits Lab	PC	0-0-3	1.5
9.		Digital Electronics and Logic Design Lab	ES	0-0-3	1.5
10.		**Skill Oriented Course –II** Circuits Simulation and Analysis Using Pspice	SC	1-0-2	2
				Total	**24.5**
Community Service Project (Mandatory) for 2 months duration during summer vacation					

Category	**CREDITS**
Basic Science course	3
Humanities and Social Sciences	3
Engineering Science Courses	4.5
Professional Core Courses	12
Skill oriented course	2
TOTAL CREDITS	**24.5**

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

Electrical & Electronics Engineering

Course Code	NUMERICAL METHODS AND PROBABILITY THEORY	L	T	P	C
		3	0	0	3

II Year 2nd Semester

Course Objectives:

This course aims at providing the student with the knowledge eon

- Various numerical methods for solving equations, interpolating the polynomials, evaluation of integral equations and solution of differential equations.
- The theory of Probability and random variables.

Course Outcomes (CO):

CO1: Apply numerical methods to solve algebraic and transcendental equations

CO2: Derive interpolating polynomials using interpolation formulae

CO3: Solve differential and integral equations numerically

CO4: Apply Probability theory to find the chances of happening of events.

CO5: Understand various probability distributions and calculate their statistical constants

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

Introduction-Bisection Method-Iterative method-Regula falsi method-Newton Raphson method System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.

UNIT - II	**Interpolation**

Finite differences-Newton's forward and backward interpolation formulae–Lagrange's formulae. Gauss forward and back ward formula, Stirling's formula, Bessel's formula.

UNIT - III	**Numerical Integration & Solution of Initial Value Problems to Ordinary Differential Equations**

Numerical Integration: Trapezoidal rule– Simpson's 1/3 Rule – Simpson's 3/8 Rule Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

UNIT - IV	**Probability theory**

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT - V	**Random Variables & Distributions**

Probability distribution-Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties-Uniform distribution-exponential distribution.

Textbooks:

1. B.S.Grewal,"Higher Engineering Mathematics", Khanna publishers.
2. Ronald Walpole, "Probability and Statistics for Engineers and Scientists", PNIE.
1. Erwin Kreyszig,"Advanced Engineering Mathematics", Wiley India

Reference Books:

1. B.V.Ramana,"Higher Engineering Mathematics", McGraw Hill publishers.
2. Alan Jeffrey, "Advanced Engineering Mathematics", Elsevier Publishers

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

Electrical & Electronics Engineering

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

II Year 2nd Semester

Course Objectives:

To make the student learn about

- Various parameters of single phase sinusoidalwaves and its representation.
- Single phase circuits locus diagrams and three phase circuits parameters
- Network theorems for a.c excitations
- To analyze the responses of circuits for D.C and A.C excitations
- To Understand the two port network parameters and its relations.

Course Outcomes (CO):

CO1: To know about RMS, average and form factors of various periodic waveforms, steady state analysis of RLC with sinusoidal excitations. Phase and phase difference, power and power factor.

CO2: To draw locus diagrams of R-L,R-C,R-L-C circuits, Resonance-series, parallel circuits of-L,R-C,R-L-C circuits, three phase circuit connections its relation with voltages and measurement of power

CO3: To analyze Superposition, Thevenin's, Norton's, Maximum power transfer, Tellegen's, Milliman's and compensation theorems for AC excitations

CO4: To study the Transient response of R-L,R-C,R-L-C circuits, the laplace transforms methods of solutions

CO5: To understand the Two port network parameters and their relations, concept to transformed network-2- port network parameters using transformed variables.

UNIT - I	**Single Phase A.C Circuits-I**

R.M.S and Average values and form factor for different periodic wave forms, Steady state analysis of R,L and C (in series, parallel and series parallel combinations) with sinusoidal excitation - Concept of Reactance, Impedance, Susceptance and Admittance - Phase and Phase difference - concept of power factor, Real and Reactive powers-J-notation, Complex and Polar forms of representation.

UNIT - II	**Single Phase A.C Circuits-II**

Complex power-Locus diagrams-series R-L,R-C,R-L-C and parallel combination with variation of various parameters-Resonance-series, parallel circuits, concept of bandwidth and Q factor.

Three Phase Circuits: Three phase circuits: Phase sequence - Star and delta connection – Relation between line and phase voltages and currents in balanced systems-Analysis of balanced and Unbalanced 3 phase circuits-Measurement of active and reactive power.

UNIT - III	**Network theorems for A.C Excitations**

For AC excitation: Duality & Dual networks. Tellegen's, Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's and Compensation theorems for a.c. excitations.

UNIT - IV	**Transient Analysis**

Transient response of R-L, R-C, R-L-C circuits (Series & Parallel combinations) for d.c.& sinusoidal excitations-Initial conditions–Classical method and laplace transforms methods of solutions.

UNIT - V	**Network parameters**

Two port network parameters-Z,Y,ABCD and hybrid parameters and their relations-concept of transformed network-2-port network parameters using transformed variables.

Textbooks:

1. Engineering circuit analysis - by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
2. Network Theory:N.C.Jagan&C.Lakshminarayana,B.S Publications.

Reference Books:

1. Network Analysis by Vanvalkenburg, PHI.
2. Linear circuit analysis (time domain phasor, and Laplace transform approaches).Second edition by RAYMONDA. DeCARLO and PEN-MIN-LIN, Oxford University Press.Second edition 2004.
3. "Circuits" by Carlson,Thomson Publishers.
4. Network Analysis:- C.K. Mithal, Khanna Publishers.
5. Electric Circuits by A.Chakrabarthy, Dhanipat Rai&Sons.
6. Electric Circuit theory by K.Rajeswaran,PearsonEducation,2004.

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

Electrical & Electronics Engineering

Course Code	AC MACHINES	L	T	P	C
		3	0	0	3
		IV			

II Year 2nd Semester

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.

Course Outcomes (CO):

By the end of the course, the student will be able to:

CO1: 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.
CO2: Predetermine the regulation of a three-phase alternator by synchronous impedance &m.m.f methods.
CO3: Predetermine the regulation of Alternator by Zero Power Factor method Xd and Xq determination of salient pole synchronous machine.
CO4: 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-gapMMFdistributionwithfixedcurrentthroughwinding-concentrated and distributed, Sinusoidally distributed winding, winding distribution factors.

UNIT - II	**Three phase Induction Machines**	

Operating principle, Construction, Types (squirrel cage 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, ZPFand 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. lectrical Machines–by P.S.Bimbra, Khanna Publishers.

References:

1. The Performance and Design of A.C .Machines–byM.G.Say, ELBSand Ptiman&Sons.
2. ElectricMachinery–byA.E.Fitzgerald,C.KingsleyandS.Umans,McGraw-HillCompanies,5thedition,1990.
3. Theory of Alternating Current Machinery by Langsdorf, Tata McGraw-Hill,2nd edition.
4. Electromechanics-III (Synchronous and single phase machines), S.Kamakashiah, Overseas publishers Pvt Ltd.
5. Electric Machines -by M.S.Sarma and M.K.Pathak, CENGAGE Learning.

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

Electrical & Electronics Engineering

Course Code	**ENGINEERING ELECTROMAGNETICS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

II Year 2nd Semester

Course Objectives:

- To understand the basic principles of electrostatics
- To understand the basic principles of magneto statics for time invariant and time varying fields
- To understand the principles of dielectrics, conductors and magnetic potentials

Course Outcomes (COs):

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

- Understand the concept of electrostatics
- Understand the concepts of Conductors and Dielectrics
- Understand the fundamental laws related to Magnetostatics
- understand the concepts of Magnetic Potential and Time varying Fields

UNIT - I **Electrostatics**

Electrostatic Fields- Coulomb's Law- Electric Field Intensity (EFI)due to Line, Surface and Volume charges-Work Done in Moving a Point Charge in Electrostatic Field-Electric Potential due to point charges, line charges and Volume Charges - Potential Gradient - Gauss Law-Application of Gauss Law-Maxwell's First Law– Numerical Problems.
Laplace and Poisson Equations - Solution of Laplace Equation in one Variable. Electric Dipole -Dipole Moment - Potential and EFI due to Electric Dipole - Torque on an Electric Dipole in an Electric Field – Numerical Problems.

UNIT - II **Conductors and Dielectrics**

Behavior of Conductors in an Electric Field-Conductors and Insulators – Electric Field Inside a Dielectric Material – Polarization – Dielectric Conductors and Dielectric Boundary Conditions – Capacitance-Capacitance of Parallel Plate, Spherical & Co-axial capacitors – Energy Stored and Energy Density in a Static Electric Field – Current Density – Conduction and Convection Current Densities – Ohm's Law in Point Form–Equation of Continuity–Numerical Problems.

UNIT - III **Magnetostatics**

Static Magnetic Fields – Biot-Savart Law – Oersted's experiment – Magnetic Field Intensity (MFI)due to Straight, Circular&SolenoidCurrentCarryingWire–
Maxwell'sSecondEquation.Ampere'sCircuitalLawanditsApplicationsViz.,MFI Due to an Infinite Sheet of Current and a Long Current Carrying Filament–Point Form of Ampere's Circuital Law–Maxwell's Third Equation– Numerical Problems.
Magnetic Force — Lorentz Force Equation – Force on Current Element in a Magnetic Field – Force on Straight and Long Current Carrying Conductor in Magnetic Field- Force Between two Straight and Parallel Current Carrying Conductors –Magnetic Dipole and Dipole moment - Differential Current Loop as a Magnetic Dipole–Torque on a Current Loop Placed in a Magnetic Field–Numerical Problems.

UNIT - IV **Magnetic Potential**

Scalar Magnetic Potential and Vector Magnetic Potential and its Properties-Vector Magnetic Potential due to Simple Configuration–Vector Poisson's Equations.
Self and Mutual Inductances–Neumann's Formulae–Determination of Self Inductance of a Solenoid and Toroid and Mutual Inductance Between a Straight, Long Wire and a Square Loop Wire in the Same Plane –Energy Stored and Intensity in Magnetic Field–Numerical Problems.

UNIT - V **Time varying Fields**

Faraday's Law of Electromagnetic Induction – It's Integral and Point Forms – Maxwell's Fourth Equation. Statically and Dynamically Induced E.M.F's – Simple Problems – Modified Maxwell's Equations for Time varying Fields– Displacement Current, pointing theorem.

Textbooks:

1. Sadiku,Kulkarni,"PrinciplesofElectromagnetics",6th Edition,OxfordUniversityPress,2015
2. William.H.Hayt,"EngineeringElectromagnetics",McGrawHill,2010.

Reference Books:

1. J.D.Kraus,"Electromagnetics",5th Edition,Mc GrawHill Inc,1999.
2. DavidK.Cheng,"Field &ElectromagneticWaves",2nd Edition,1989.
3. JosephA.Edminister,"Electromagnetics",2Edition,Schaum'sOutline,McGrawHill,
4. K.A. Gangadhar and P.M. Ramanathan, "Electomagnetic Field Theory", 8th Reprint,KhannaPublications, 2015.

WEB LINK:

1) nptel.ac.in–coursera.org-engg.vediolectures.com.
2) https://www.youtube.com/watch?v=XZehRIgB-ys.

https://www.youtube.com/watch?v=ThIbiFCRaa4

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

Electrical & Electronics Engineering

Course Code	DIGITAL ELECTRONICS AND LOGIC DESIGN	L	T	P	C
		3	0	0	3

II Year 2nd Semester

Course Objectives:

- To teach significance of number systems, conversions, binary codes and functionality of logic gates.
- TodiscussdifferentsimplificationmethodsforminimizingBooleanfunctions.
- To impart knowledge on operation, characteristics, and various configurations of TTL and CMOS logic families.
- To outline procedures for the analysis and design of combinational and sequential logic circuits.
- To introduce programmable logic devices.

Course Outcomes (CO):

After completion of the course, student will be able to

CO1: Understand various number systems, error detecting, correcting binary codes, logic families, combinational and sequential circuits.

CO2: Apply Boolean laws, k-map and Q-M methods to minimize switching functions. Also describe the various performance metrics for logic families.

CO3: Design combinational and sequential logic circuits.

CO4: Compare different types of Programmable logic devices and logic families.

UNIT - I	**Number Systems and Codes**	

Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, ASCII code, Excess -3 codes, Gray code. Binary codes Classification, Error detection and correction – Parity generators and checkers –Fixed point and floating-point arithmetic.

Boolean Algebra & Logic Gates: Boolean operations, Boolean functions, Algebraic manipulations, Min-terms and Maxterms, Sum-of-products and Product-of-sum representations, Two-input logic gates, NAND/NOR implementations. **Minimization of Boolean Functions:** Karnaugh map, Don't-care conditions, Prime implicants, Minimization of functions using Quine-McClusky method.

UNIT - II	**Combinational Circuits**	

Introduction, Analysis of combinational circuits, Design procedure, Binary Adder- Subtractor, Decimal Adder, Multiplier, Comparator, Code Converters, Encoders, Decoders, Multiplexers, Demultiplexers, Illustrative examples.

Sequential Circuits-1: Introduction, Latches –RS latch and JK latch, Flip-flops-RS, JK, T and D flip flops, Master-slave flipflops, Edge-triggered flip-flops, Flip-flop conversions.

UNIT - III	**Sequential Circuits-2**	

Analysis and Design of Synchronous Sequential Circuits: Moore and Mealy machine models, State Equations, State Table, State diagram, State reduction & assignment, Algorithmic state Machines (ASM).

Registers and Counters: Registers, shift registers, Ripple counters, Synchronous counters, Modulus-N-Counter, Ring counter, Johnson counter, Up-Down counter.

UNIT - IV	**Memory and Programmable Logic**	

RAM, Types of Memories, Memory decoding, ROM, Types of ROM, Programmable Logic Devices (PLDs): Basic concepts, PROM as PLD, Programmable Array Logic (PAL) and Programmable Logic Array(PLA), Design of combinational and sequential circuits using PLDs.

UNIT - V	**DigitalLogicFamilies**	
Unipolar and Bipolar Logic Families, Transistor-Transistor Logic(TTL):Operation of TTL, Current sink logic, TTL with active pull up, TTL with open collector output, Shockley TTL, TTLcharacteristics,I^2L, ECL logic Families.		

Textbooks:

1. M.Morris Mano and Michael D. Ciletti,"DigitalDesign",4thEditionPearsonEducation,2013.
2. Z.Kohavi and N.K. Jha, "Switching and Finite Automata Theory", Third Edition, Tata McGrawHill,2010.
3. R.P.Jain,"Modern Digital Electronics", 4thedition, Mc Graw Hill Education, India Private Limited,2012.

Reference Books:

1. Charles H Roth (Jr) and Larry L. Kinney, "Fundamentals of Logic Design", 5th Edition Cengage Learning India Edition, ,2010.
2. John. M Yarbrough, "Digital Logic Applications and Design", Thomson Learning,2006.

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

Electrical & Electronics Engineering

Course Code	UHV-II: UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	L	T	P	C
		2	1	0	3
II Year 2nd Semester					

Course Objectives

- To help the students appreciate the essential complementarily 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 a 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 behaviour and mutually enriching interaction with Nature.

Thus, this course is intended to provide a much-needed orientational input in value education to the young enquiring minds.

Course Methodology

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. The course is in the form of 28 lectures (discussions) and 14 practice sessions.
3. It is free from any dogma or value prescriptions.
4. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation – the whole existence is the lab and every activity is a source of reflection.
5. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student in every activity, leading to continuous self-evolution.
6. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

Catalogue Description

Every human being has two sets of questions to answer for his/her life: a) what to do? and, b) how to do? The first set pertains to the value domain, and the other to the skill domain. Both are complimentary, but value domain has a higher priority. Today, education has become more and more skill biased, and hence, the basic aspiration of a human being, that is to live with happiness and prosperity, gets defeated, in spite of abundant technological progress. This course is aimed at giving inputs that will help to ensure the right understanding and right feelings in the students in their life and profession, enabling them to lead an ethical life. In this course, the students learn the process of self-exploration, the difference between the Self and the Body, the naturally acceptable feelings in relationships in a family, workplace and society, the comprehensive human goal in the society, the mutual fulfillment in the nature and the co-existence in existence. As a natural outcome of such inputs, they are able to evaluate an ethical life and profession ahead.

Course Syllabus

Module 1: Introduction-Basic Human Aspiration, its fulfillment through All-encompassing Resolution

The basic human aspirations and their fulfillment through Right understanding and Resolution, Right understanding and Resolution as the activities of the Self, Self being central to Human Existence; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution

Module2: Right Understanding (Knowing)- Knower, Known & the Process

The domain of right understanding starting from understanding the human being (the knower, the experiencer and the doer) and extending up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).

Module 3: Understanding Human Being

Understanding the human being comprehensively as the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Basis for harmony/contradiction in the self

Module 4: Understanding Nature and Existence
A comprehensive understanding (knowledge) about the existence, Nature being included; the need and process of inner evolution (through self-exploration, self-awareness and self-evaluation), particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence).

Module 5: Understanding Human Conduct, All-encompassing Resolution & Holistic Way of Living
Understanding Human Conduct, different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavor viz.,
realization, thought, behavior and work (participation in the larger order) leading to harmony at all levels from Self to Nature and entire Existence

Textbook
1. R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course inHuman Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.

References
1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya EkParichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
9. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &Engineers, Oxford University Press
10. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Mode of Evaluation:
Based on participation of student in classroom discussions/Self-assessment/Peer assessment/Assignments/ Seminar/Continuous Assessment Test/Semester End Exam
Socially relevant project/Group Activities/Assignments may be given importance in this course

Course Outcomes
At the end of the course, the students will be able to
1. Evaluate the significance of value inputs in formal education and start applying them in their life and profession
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Analyze the value of harmonious relationship based on trust and respect in their life and profession
4. Examine the role of a human being in ensuring harmony in society and nature.
5. Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.

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

Electrical & Electronics Engineering

Course Code	ACMACHINES LAB	L	T	P	C
		0	0	3	1.5

II Year 2nd Semester

Course Objectives:

- To understand the induction motor operation.
- To understand the characteristics of induction motor.
- To examine the speed response of induction motors.
- To find the characteristics of single-phase induction motor.
- To analyses the voltage regulation of alternator.

Course Outcomes (CO):

CO1: Know operation of three phase induction motor.
CO2: To draw the performance characteristics of three phase induction motor experimentally.
CO3: Analyze speed controlling methods of three phase induction motor.
CO4:Draw the equivalent circuit of single phase induction motor.
CO5: Finding the voltage regulation of alternator with various methods practically.

List of Experiments:

1. No-load Blocked rotor tests on Squirrel cage Induction motor.
2. Load test on three phase slip ring Induction motor.
3. Load test on three phase squirrel cage Induction motor.
4. Speed control of three phase induction motor
5. Rotor resistance starter for slipring induction motor
6. Load test on single phase induction motor.
7. Determination of Equivalent circuit of a single-phase induction motor.
8. Predetermination of Regulation of a three phase alternator by synchronous impedance &m.m.f methods.
9. Predetermination of Regulation of three-phase alternator by Z.P.F. method.
10. Determination of Xd and Xqo fa salient pole synchronous machine by slip test.
11. Vand inverted V curves of a3-phase synchronous motor

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

Electrical & Electronics Engineering

Course Code	AC CIRCUITS LAB	L	T	P	C
		0	0	3	1.5
II Year 2nd Semester					

Course Objectives:

- To understand the theorems practically with DC and AC excitations.
- To draw the locus diagrams of electrical parameters.
- To design series and parallel resonance circuits.
- To determining the various parameters.

Course Outcomes (CO):

CO1:To check the various theorems practically.
CO2: Drawing the locus diagrams for electrical parameters.
CO3: Designing the series and parallel resonance circuits.
CO4: Understanding the various electrical parameters.

List of Experiments:

Conduct at least 10 experiments from the following list.

1. Verification of super position theorem with A.C. excitation
2. Verification of reciprocity theorem with A.C. excitation
3. Verification of maximum power transfer theorem with A.C. excitation
4. Verification of Thevenin's theorem with A.C. excitation
5. Verification of Norton's theorem with A.C. excitation
6. Verification of milliman's theorem with A.C. excitation
7. Verification of compensation theorem with A.C. excitation
8. Verification of Tellegen's ,theorem with A.C. excitation
9. Locus Diagram of RL Series Circuits: a)Variable 'R' and Fixed 'L' b) Variable 'L' and Fixed 'R'
10. Locus Diagram of RC Series Circuits: a) Variable 'R' and Fixed 'C' b) Variable 'C' and Fixed 'R'
11. Series Resonance
12. Parallel Resonance
13. Determination of Z Parameters
14. Determination of Y Parameters
15. Transmission Parameters
16. Hybrid Parameters
17. Response Analysis of R, RL and RLC circuits with sinusoidal and non-sinusoidal excitations.

References:

1. D. P.Kothari and B. S. Umre, "Laboratory Manual for Electrical Machines" I.K International Publishing House Pvt. Ltd, 2017.
2. D.R. Kohli and S.K. Jain, "A Laboratory Course in Electrical Machines" NEM Chand & Bros.
3. P.S.Bimbra
4. Longdraff

Online Learning Resources/Virtual Labs:

- http://vem-iitg.vlabs.ac.in/
- http://em-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical Engineering
- http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/Sadhya/experimentlist.html

Note: Faculty members (who are handling the laboratory) are requested to instruct the students not touse readymade kits for conducting the experiments. They are advised to make the students work in the laboratory by constructing the circuits and analysing them during the lab sessions.

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

Electrical & Electronics Engineering

Course Code	CIRCUITS SIMULATION AND ANALYSIS USING PSPICE	L	T	P	C
		1	0	2	2
II Year 2nd 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 thevinin's equivalent
3. Pspice simulation of d.c.network with subcircuit
4. Pspice simulation of transient and parametric analysis of series RLC circuits using step 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

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 &Electronics Engineering					
III Year I Semester					
SNo	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Electrical Power Generation and Economic Aspects	PC	3 – 0 - 0	3
2		Power Electronics	PC	3 – 0 - 0	3
3		Control Systems	PC	3 – 0 - 0	3
4		**Professional Elective course – I**	PE	3 – 0 - 0	3
5		**Open Elective - I**	OE	3 – 0 - 0	3
6		Power Electronics Lab	PC	0 – 0 -3	1.5
7		Control Systems Lab	PC	0 – 0-3	1.5
8		**Skill oriented course– III** Soft Skills	SC	1 – 0-2	2
Evaluation of Community Service Project/Internship			PR		1.5
				Total credits	**21.5**

List of Professional Electives-I	**List of Open Electives-I**
1. Power Quality 2. Renewable Energy Sources 3. Computer organization	Candidate should select the subject from list of subjects offered by other departments.

Category	**CREDITS**
Professional core Courses	12
Professional Elective courses	3
Open Elective Course/Job oriented elective	3
Skill advanced course/soft skill course*	2
Summer Internship	1.5
TOTALCREDITS	21.5

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	Electrical Power Generation and Economic Aspects	L	T	P	C
		3	0	0	3

III Year 1st Semester

Course Objectives:

To make the student learn about

- Principle of operation of different components of a thermal power stations.
- Principle of operation of different components of a nuclear power stations.
- Constructional and operation of different components of an Air and Gas Insulated substations.
- Constructional details of different types of cables.
- Different types of load curves and tariffs applicable to consumers

Course Out comes(CO):

CO1: Differentiate the components of thermal power plants.

CO2: Assess different components of nuclear power plants.

CO3: Identify the different components of air and gas insulated substations.

CO4: Explicit the single core and three core cables with different insulating materials.

CO5: Analyse the different economic factors of power generation and tariffs

UNIT-I	**Thermal Power Stations**

Selection of site, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: boilers, super heaters, economizers, 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, different types of gas insulated substations, single line diagram of gas insulated substations, constructional aspects of GIS, installation and maintenance of GIS, comparison of air insulated substations and gas insulated substations

UNIT-IV	**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	**Economic Aspects of Power Generation & 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, power 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.

Textbooks:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagarand , A. Chakrabarti, Dhanpat Rai& Co. Pvt. Ltd.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa New age International (P) Limited, Publishers.

Reference Books:

1. Electrical Power Distribution Systems by V. Kamaraju, TataMcGraw Hill, New Delhi.
2. Elements of Electrical Power Station Design by M V Deshpande, PHI, New Delhi.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

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

III Year 1st Semester

Course Objectives:

To make the student learn about

- Understand the differences between signal level and power level devices.
- Analyze controlled rectifier circuits.
- Analyze the operation of DC-DC choppers.

Analyze the operation of voltage source inverters

Course Outcomes(CO):

CO1: Understand the basic power semiconductor devices their construction, principle of working and their characteristics

CO2: Understand the concepts of phase control technique, midpoint and bridge connections of half and full controlled converters with various loads for 1Ø -phase converters, effect of source inductance and dual converters.

CO3: Analyze and evaluate voltages and currents, active and reactive power inputs to converter with and without freewheeling diode for 3Øconverters

CO4: Understand the concepts of various control strategies, types of choppers and analyze their principle operation, waveforms of voltages and currents at different loads

CO5: Understand the construction and operation of AC Voltage Controllers and Cyclo Converters.

UNIT-I	**POWER SEMI CONDUCTOR DEVICES**

Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn on methods- Dynamic characteristics of SCR - Turn on and Turn off times -Salient points.Two transistor analogy – SCR – R and RC Triggering - UJT firing circuit —– Series and parallel connections of SCR's – Snubber circuit details – Specifications of SCR's, BJT, IGBT - Numerical problems.

UNIT-II	**PHASE CONTROLLED RECTIFIERS**

Phase control technique – Single phase Line commutated converters – Mid point and Bridge connections – Half controlled converters with Resistive, RL loads and RLE load– Derivation of average load voltage and current -Active and Reactive power inputs to the converters without and with Free wheeling Diode – Numerical problems.

Fully controlled converter- Mid point and Bridge connections with Resistive, RL loads - Derivation of average load voltage and current – Line commutated inverters -Active and Reactive power inputs to the converters without and with Free wheeling Diode, Effect of source inductance – Derivation of load voltage and current – Numerical problems.

UNIT-III	**THREE PHASE LINE COMMUTATED CONVERTERS**

Three phase converters – Three pulse and six pulse converters – Mid point and bridge connections average load voltage With R and RL loads – Effect of Source inductance–Dual converters (both single phase and three phase) - Waveforms –Numerical Problems.

UNIT-IV	**CHOPPERS & INVERTERS**

Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper– Load voltage expression. Morgan chopper-Jones chopper (Principle of operation only) wave forms, Problems.

INVERTERS- Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter bridge inverter – Waveforms – Numerical problems.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

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, Numerical Problems.

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 Moha, "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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

CourseCode	CONTROLSYSTEMS	L	T	P	C
		3	0	0	3

III Year 1st Semester

Course Objectives:

To make the student earn about

- Merits and demerits of open loop and closed loop systems;the effect of feedback
- The use of block diagram algebra and Mason's gain formula to find the overall transfer function
- Transient and steady state response, time domain specifications and the concept of Root loci
- Frequency domain specifications, Bode diagrams and Nyquist plots

State space modeling of Control system

Course Out comes(CO):

CO1: Understand the concepts of control systems classification, feedback effect, mathematical modelling, time response and frequency response characteristics, state space analysis

CO2: Apply the concepts of Block diagram reduction, Signal flow graph method and state space formulation for obtaining mathematical and Root locus, Bode, Nyquist, Polar plots for stability calculations, controllability and observability and demonstrate the use of these techniques.

CO3: Analyse time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.

CO4: Design and develop different compensators, controllers and their performance evaluation for various conditions. Implement them in solving various engineering applications.

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 RESPONS EANALYSIS**

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.

Compensationtechniques–Lag,Lead,Lag-LeadCompensatordesigninfrequencyDomain

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.

Textbooks:

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

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. ControlSystemsPrinciples&DesignbyM.Gopal,4thEdition, McGraw Hill Education,2012.
2. Automatic Control Systems by B. C. Kuo and Farid Golnaraghi, John wiley and sons, 8thedition,2003.
3. Feedback an Control Systems, Joseph JDistefanoIII,AllenRStubberud&IvanJWilliams,2nd Edition, Schaum' soutlines, McGrawHill 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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	POWER QUALITY (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 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):

CO1: Understand the basic concepts of different power quality issues and to mitigate them, principles of regulation of long duration voltage variations

CO2: Analyze voltage disturbances and power transients that are occurring in power systems.

CO3: Understand the concept of harmonics in the system and their effect on different power system equipment.

CO4: 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 forover 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, capacitors for 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. PowerqualitybyC.Sankaran,CRCPress,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-IEEEPress,2000

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	Renewable Energy Sources (Professional Elective Course-I)	L	T	P	C
		3	0	0	3

III Year 1st Semester

Course Objectives:

To make the student learn about

- basics of energy systems, solar energy and solar thermal Systems
- solar photo voltaic systems construction characteristics and design
- wind energy conversion systems, Betz coefficient, tip speed ratio and maximum power point techniques of wind energy
- basic principle and working of hydro, tidal
- basic principle and working of different fuel cells, biomass digesters and geothermal systems

Course Outcomes(CO):

CO1: Analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface solar thermal collectors, solar thermal plants

CO2: Design solar photo voltaic systems, maximum power point techniques in solar pv

CO3: Develop wind energy conversion systems, wind generators, power generation and wind energy systems

CO4: Explain basic principle and working of hydro, tidal energy systems

CO5: Explain biomass, fuel cell and geothermal systems.

UNIT-I	**Fundamentals of Energy Systems, Solar Energy and Solar Thermal Systems**

Energy conservation principle – Energy scenario (world and India) – various forms of renewable energy - Solar radiation: Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces -Liquid flat plate collectors: Performance analysis –Transmissivity– Absorptivity product collector efficiency factor – Collector heat removal factor. Introduction to solar air heaters – Concentrating collectors, solar pond and solar still – solar thermal plants

UNIT-II	**Solar Photovoltaic Systems**

Solar photovoltaic cell, module, array – construction – Efficiency of solar cells – Developing technologies – Cell I-V characteristics – Equivalent circuit of solar cell – Series resistance – Shunt resistance – Applications and systems – Balance of system components - System Design: storage sizing – PV system sizing – Maximum power point techniques: Perturb and observe (P&O) technique – Hill climbing technique

UNIT-III	**Wind Energy**

Sources of wind energy - Wind patterns – Types of turbines –Horizontal axis and vertical axis machines - Kinetic energy of wind – Betz coefficient – Tip–speed ratio – Efficiency – Power output of wind turbine – Selection of generator (synchronous, induction) – Maximum power point tracking – wind farms – Power generation for utility grids.

UNIT-IV	**Hydro and Tidal power systems**

Basic working principle – Classification of hydro systems: Large, small, micro – measurement of head and flow – Energy equation – Types of turbines – Numerical problems. Tidal power – Basics – Kinetic energy equation – Turbines for tidal power - Numerical problems – Wave power – Basics – Kinetic energy equation – Wave power devices – Linear generators

UNIT-V	**Biomass, fuel cells and geothermal systems**

Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing. Fuel cell: Classification of fuel for fuel cells – Fuel cell voltage– Efficiency – V-I characteristics. Geothermal: Classification – Dry rock and hot acquifer – Energy analysis – Geothermal based electric power generation

Textbooks:

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition
2. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis -second edition,2013

Reference Books:

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

1. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford University Press.
2. Renewable Energy- Edited by Godfrey Boyle-oxford university. press,3rd edition,2013
3. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI
6. Non-conventional energy source –B.H.khan- TMH-2 nd edition

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & 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 & Electronics Engineering

Course Code	POWER ELECTRONICS LAB	L	T	P	C
		0	0	3	1.5

III Year 1st Semester

Course Objectives:

- Characteristics of various power electronic devices.
- Performance of single-phase half controlled and fully controlled bridge converters with both resistive and inductive loads.
- Operation of three phase half controlled and fully controlled bridge converters with both resistive and inductive loads.
- Working of single phase and three phase inverters.
- Performance of AC Voltage controller and DC-DC Converters.

Course Outcomes(CO):

CO1:Draw the characteristics of various power electronic devices

CO2:Analyze the performance of single phase and three phase half and full bridge converters with both resistive and inductive loads

CO3: Understand the working of Buck converter, Boost converter, single–phase and three phase inverters

CO4:Understand the operation of single-phase Ac voltage regulator with resistive and inductive loads

CO5:Simulate various power electronic converters

List of Experiments:

1. Study of Characteristics of Thyristor, MOSFET & IGBT.
2. Design and development of a firing circuit for Thyristor.
3. Design and development of gate drive circuits for IGBT.
4. Single Phase half wave-controlled converter with R and RL load.
5. Single Phase half-controlled converter with R and RL load.
6. Single Phase fully controlled bridge converter with R and RL load.
7. Three Phase half-controlled converter with R and RL load.
8. Three Phase fully controlled converter with R and RL load.
9. Single Phase AC Voltage controller with R and RL Load.
10. Single phase half bridge and full bridge inverter with R and RL load.
11. Three Phase inverter with R-load (120^0 and 180^0 modes).
12. Buck and Boost converter in CCM operation.
13. Simulation of single-phase full converter with R and RL Load using MAT LAB/P-spice /PSIM.
14. Simulation of three phase full converter with R and RL Load using MAT LAB/P-spice /PSIM.
15. Simulation of Buck-Boost converter in CCM operation using MAT LAB/P-spice /PSIM.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

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

III Year 1st Semester

Course Objectives:

- Determination of transfer functions of various systems and control of it by different methodologies.
- To provide knowledge in the analysis and design of controllers and compensators.
- The characteristics of servo mechanisms which are helpful in automatic control systems.
- To know the stability analysis using MATLAB.

Course Outcomes(CO):

CO1:Get the knowledge of feedback control and transfer function of DC servo motor
CO2: Model the systems and able to design the controllers and compensators
CO3: Get the knowledge about the effect of poles and zeros location on transient and steady state behavior of second order systems and can implement them to practical systems and MATLAB
CO4:Determine the performance and time domain specifications of first and second order systems

List of Experiments:

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servomotor
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 phaseplot
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Simulation of Op-Amp based Integrator and Different circuits.
12. Linear system analysis (Time domain analysis, Error analysis)using SoftTools.
13. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using Soft Tools
14. State space model for classical transfer function using Soft Tools– Verification.
15. PI and PID Controller design for Temperature Control using Soft Tools.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	SOFTSKILLS (Skill Oriented Course-III)	L	T	P	C
		1	0	2	2

III Year 1st Semester

Course Objectives:

To make the student learn about

- 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 develop leadership skills and organizational skills through group activities
- To function effectively with heterogeneous teams

Course Outcomes(CO):

CO1: Memorize various elements of effective communicative skills

CO2: Interpret people at the emotional level through emotional intelligence

CO3: apply critical thinking skills in problem solving

CO4: Analyse the needs of an organization for team building

CO5: Judge the situation and take necessary decisions as a leader

CO6: Develop social and work-life skills as well as personal and emotional well-being.

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

Introduction, meaning, significance of soft skills – definition, significance, types of communication skills - Intrapersonal & Inter-personal skills - Verbal and Non-verbal Communication

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 of the 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

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 –Methods of decision making – 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	**Leadership Skills**

Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk-Taking - Team Building - Time Management Activities:

Forming group with a consensus among the participants- choosing a leader- encouraging the group members to

express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment –vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making, Group discussion etc

Textbooks:

1. Personality Development and Soft Skills (English, Paperback, Mitra BarunK.)Publisher: Oxford University Press; Pap/Cdr edition (July 22, 2012)
2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha KapoorPublisher : I K International Publishing House; 0 edition (February 28, 2018)

Reference Books:

1. Soft skills: personality development for life success by Prashant Sharma, BPB publications 2018.
2. Soft Skills By Alex K. Published by S.Chand
3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, angeetha Sharma Published by Wiley.
4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books
5. SOFT SKILLS for a BIG IMPACT (English, Paperback, RenuShorey) Publisher: Notion Press
6. Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher: Vayu Education of India

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 &Electronics Engineering					
III Year II Semester					
SNo	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		Power System Analysis	PC	3 – 0 - 0	3
2		Measurements & Sensors	PC	3 – 0 - 0	3
3		Digital signal Processing	PC	3 – 0 - 0	3
4		**Professional Elective-II**	PE	3 – 0 - 0	3
5		**Open Elective -II**	OE	3 – 0 - 0	3
6		Power System Simulation Lab	PC	0 – 0 -3	1.5
7		Digital Signal Processing Lab	PC	0 – 0 -3	1.5
8		Measurements & Sensors Lab	PC	0 – 0 -3	1.5
9		**Skill Oriented Course –IV** Soft Computing Tools	SC	1 – 0-2	2
10		**Mandatory Non-Credit Course-III** Indian constitution	MC	2 – 0-0	0
				Total credits	**21.5**
Industrial/Research Internship (Mandatory) for 2 months duration during summer vacation					

List of Professional Electives-II	**List of Open Electives-II**
1. Transmission & Distribution of electrical power 2. Nonlinear System Analysis 3. Design of Photo voltaic Systems	Candidate should select the subject from list of subjects offered by other departments.

Category	**CREDITS**
Professional core courses	13.5
Professional Elective courses	3
Open Elective Course/Job oriented elective	3
Skill advanced course/soft skill course*	2
Mandatory course(AICTE)	0
TOTAL CREDITS	**21.5**

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	POWER SYSTEM ANALYSIS	L	T	P	C
		3	0	0	3

III Year 2nd Semester

Course Objectives:

To make the student learn about

- 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):

CO1: Remember and understand the concepts of per unit values, Y Bus and Z bus formation, load flow studies, symmetrical and unsymmetrical fault calculations

CO2: 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

CO3: Analyses 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

CO4: Develop accurate algorithms for different networks and determine load flow studies and zero, positive and negative sequence impedances to find fault calculations

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 (Problems)

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 Analysis**

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

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	MEASUREMENTS & SENSORS	L	T	P	C
		3	0	0	3

III Year 2nd Semester

Course Objectives:

To make the student learn about

- The student has to acquire knowledge about:
- The basic principles of different types of electrical instruments for the measurement of voltage, current, power factor, power and energy.
- The measurements of RLC parameters using bridge principles.
- The principles of magnetic measurements
- The principle of working of CRO and its applications

Course Outcomes (CO):

CO1: Able to Understand the working of various instruments and equipments used for the measurement of various electrical engineering parameters like voltage, current, power, phase etc in industry as well as in power generation, transmission and distribution sectors

CO2: Able to analyze and solve the varieties of problems and issues coming up in the vast field of electrical measurements

CO3: Analyse the different operation of extension range ammeters and voltmeters, DC and AC bridge for measurement of parameters and different characteristics of periodic and aperiodic signals using CRO

CO4: Design and development of various voltage and current measuring meters and the varieties of issues coming up in the field of electrical measurements

UNIT - I **Measuring Instruments & Digital Meters**

Classification – Ammeters and Voltmeters – PMMC, Dynamometer, Moving Iron Types –Expression for the Deflecting Torque and Control Torque – Errors and their Compensation, Extension of range – Numerical examples.

Digital Voltmeters-Successive Approximation, Ramp, and Integrating Type-Digital Frequency Meter-Digital Multimeter-Digital Tachometer.

UNIT - II **Measurement Of Power, Power Factor And Energy**

Single Phase Dynamometer Wattmeter, LPF and UPF, Double Element and Three Elements, Expression for Deflecting and Control Torques; P.F. Meters: Dynamometer and Moving Iron Type –1-ph and 3-ph Power factor Meters. Single Phase Induction Type Energy Meter – Driving and Braking Torques – Errors and their Compensation, Three Phase Energy Meter – Numerical examples.

UNIT - III **Instrument Transformers, Potentiometers, And Magnetic Measurements**

Current Transformers and Potential Transformers – Ratio and Phase Angle Errors – Methods for Reduction of Errors-Design Considerations. DC Potentiometers: Principle and Operation of D.C. Crompton's Potentiometer – Standardization – Measurement of unknown Resistance, Currents and Voltages. A.C. Potentiometers: Polar and Coordinate types- Standardization – Applications.Determination of B-H Loop Methods of Reversals - Six Point magnetic measurement Method – A.C. Testing – Iron Loss of Bar Samples – Numerical Examples

UNIT - IV **D.C & A.C Bridges**

Method of Measuring Low, Medium and High Resistances – Sensitivity of Wheatstone's Bridge –Kelvin's Double Bridge for Measuring Low Resistance, Measurement of High Resistance – Loss of Charge Method. Measurement of Inductance - Maxwell's Bridge, Anderson's Bridge. Measurement of Capacitance and Loss Angle – DeSauty Bridge. Wien's Bridge – Schering Bridge – Numerical Examples.

UNIT - V **CRO and Sensors**

Cathode Ray Oscilloscope- Cathode Ray Tube-Time Base Generator-Horizontal and Vertical Amplifiers – Applications of CRO – Measurement of Phase, Frequency, Current and Voltage-Lissajous Patterns.

Capacitive and Inductive displacement sensors, Electromagnetism in sensing, Flow, Level sensors, Position and Motion sensors, Pressure sensors and Temperature sensors

Textbooks:

1. Electrical & Electronic Measurement & Instruments by A.K.SawhneyDhanpat Rai & Co. Publications,

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

2007.
2. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications, 2011

Reference Books:

1. Electronic Instrumentation by H. S. Kalsi, Tata Mcgrawhill, 3rd Edition, 2011.
2. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, 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: Handbook by Jon S. Wilson, ELSEVIER publications, 2005.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	DIGITAL SIGNAL PROCESSING	L	T	P	C
		3	0	0	3

III Year 2nd Semester

Course Objectives:

To make the student learn about

- To describe discrete time signals and systems.
- To teach importance of FFT algorithm for computation of Discrete Fourier Transform.
- To expose various implementations of digital filter structures.
- To present FIR and IIR Filter design procedures.
- To outline need of Multi-rate Processing.

Course Outcomes (CO):

CO1: Formulate difference equations for the given discrete time systems

CO2: Apply FFT algorithms for determining the DFT of a given signal

CO3: Compare FIR and IIR filter structures

CO4: Design digital filter (FIR & IIR) from the given specifications

CO5: Outline the concept of multirate DSP and applications of DSP.

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, 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, Direct form-II, 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, Hanging, Hamming, Blackman), Comparison of IIR & FIR filters, Basic structures of FIR Filters – Direct form, Cascade form, Linear phase realizations.

UNIT - V

Quantization Errors in Digital Signal Processing: Representation of numbers, Quantization of filter coefficients, Round-off Effects in digital filters.

Multirate Digital Signal Processing: Decimation, Interpolation, Sampling rate conversion by a rational factor; Frequency domain characterization of Interpolator and Decimator; Polyphase decomposition.

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

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	TRANSMISSION AND DISTRIBUTION OF ELECTRIC POWER (Professional Elective Course-II)	L	T	P	C
		3	0	0	3

III Year 2nd Semester

Course Objectives:

To make the student learn about

- Compute inductance/capacitance of transmission lines and to understand the concepts of GMD/GMR.
- Study the Short and Medium length transmission lines, their models and performance.
- Study the performance and modeling of long transmission lines.
- Study the effect of travelling waves on transmission lines and study the factors affecting the performance of transmission lines and power factor improvement methods.
- Discuss sag and tension computation of transmission lines as well as to study the performance of overhead insulators

Course Outcomes (CO):

CO1: Know various transmission line parameters during different operating conditions

CO2: Know the performance of short and medium transmission lines.

CO3: Analyze the performance of long transmission line.

CO4: Discuss about corona phenomenon and compute the power loss due to corona.

CO5: Calculate sag of overhead transmission lines and string efficiency of insulators.

UNIT - I	**Transmission Line Parameters**

Conductor materials - Types of conductors – Calculation of resistance for solid conductors – Calculation of inductance for single phase and three phase– Single and double circuit lines– Concept of GMR and GMD– Symmetrical and asymmetrical conductor configuration with and without transposition–Bundled conductors-Numerical Problems–Calculation of capacitance for 2 wire and 3 wire systems – Effect of ground on capacitance – Capacitance calculations for symmetrical and asymmetrical single and three phase–Single and double circuit lines- Bundled conductors–Numerical Problems

UNIT - II	**Performance of Short and Medium Transmission Lines**

Classification of Transmission Lines – Short, medium, long line and their model representations –Nominal-T–Nominal-π and A, B, C, D Constants for symmetrical and Asymmetrical Networks– Numerical Problems–Mathematical Solutions to estimate regulation and efficiency of all types of lines – Numerical Problems

UNIT - III	**Performance of Long Transmission Lines**

Long Transmission Line–Rigorous Solution – Evaluation of A,B,C,D Constants–Interpretation of the Long Line Equations, regulation and efficiency– Incident, Reflected and Refracted Waves –Surge Impedance and SIL of Long Lines–Wave Length and Velocity of Propagation of Waves – Representation of Long Lines – Equivalent-T and Equivalent πnetwork models-Numerical Problems.

UNIT - IV	**Power System Transients &Factors governing the Performance of Transmission line**

Types of System Transients – Travelling or Propagation of Surges – Attenuation–Distortion– Reflection and Refraction Coefficients – Termination of lines with different types of conditions – Open Circuited Line–Short Circuited Line – T-Junction– Lumped Reactive Junctions. Skin and Proximity effects – Description and effect on Resistance of Solid Conductors –Ferranti effect – Charging Current –Shunt Compensation –Corona –Description of the phenomenon–Factors affecting corona–Critical voltages and power loss – Radio Interference.

UNIT - V	**Sag and Tension Calculations and Overhead Line Insulators**

Sag and Tension calculations with equal and unequal heights of towers–Effect of Wind and Ice on weight of Conductor–Numerical Problems – Stringing chart and sag template and its applications–Types of Insulators – String efficiency and Methods for improvement–Numerical Problems – Voltage distribution–Calculation of string efficiency–Capacitance grading and Static Shielding.

Textbooks:

1. Electrical power systems – by C.L.Wadhwa, New Age International (P) Limited, Publishers, 1998.

2. Modern Power System Analysis by I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 2nd Edition
Reference Books:
1. Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4th edition. 2. Power System Analysis and Design by B.R.Gupta, Wheeler Publishing. 3. A Text Book on Power System Engineering by L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, DhanpatRai & Co.Pvt. Ltd 4. Electrical Power Systems by P.S.R. Murthy, B.S.Publications

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	NONLINEAR SYSTEM ANALYSIS (Professional Elective Course-II)	L	T	P	C
		3	0	0	3

III Year 2nd Semester

Course Objectives:

To make the student learn about

- Basics of Nonlinear systems
- Mathematical preliminaries
- Stability concepts and various case studies

Course Outcomes (CO):

CO1: Understand the basic concepts of Nonlinear systems

CO2: Understand the mathematical analysis of nonlinear systems

CO3: Analyze various nonlinear case studies

CO4: Evaluation of stability conditions for given nonlinear systems

UNIT - I	**Mathematical Preliminaries-I**

Why nonlinear systems? - Non-linear Models of Physical Systems, Mathematical Preliminaries: Finite dimensional normed spaces, Euclidean space and its topology, Infinite dimensional Banach spaces - Contraction mapping theorem.

UNIT - II	**Mathematical Preliminaries-II**

Existence and Uniqueness results for solutions to nonlinear ODEs, ODEs as vector fields - One dimensional systems - Phase portrait of second order linear systems -Equilibrium points, linearization and their classification.

UNIT - III	**Case Studies**

Examples: Simple pendulum, Bead on a hoop, Lotka-Volterra models for predation and competition, biological transcriptional system, van der Pol oscillator and conservative systems, nonlinear circuits - Limit cycles.

UNIT - IV	**Stability Criterion-I**

Bifurcations of two-dimensional flows: Saddle-node, pitchfork, transcritical and Hopf - their normal forms, Notions of stability - Lyapunov and LaSalle's theorems, Finding Lyapunov functions: Linear systems, variable gradient method - Center Manifold Theorem.

UNIT - V	**Stability Criterion-II**

Physical Non-linearities - Interconnections and feedback - Aizermann's conjecture – Passivity, PR systems - Dissipation equality - Passive filters, KYP Lemma - Popov and circle criterion.

Textbooks:

1. Nonlinear Systems - Hassan Khalil
2. Nonlinear dynamics and chaos: with applications to physics, biology, chemistry, and engineering -Steven Strogatz.

Reference Books:

1. Nonlinear systems: analysis, stability, and control - S.S.Sastry
2. Nonlinear Systems Analysis – Vidyasagar.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	DESIGN OF PHOTOVOLTAIC SYSTEMS (Professional Elective Course-II)	L	T	P	C
		3	0	0	3

III Year 2nd 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):

CO1: Understand the basic concepts of PV Cells

CO2: Understand the concepts of Energy estimation and Sizing

CO3: Design MPPT

CO4: 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, MPPT for 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 & Electronics Engineering

Course Code	POWER SYSTEM SIMULATION LAB	L	T	P	C
		0	0	3	1.5

III Year 2nd Semester

Course Objectives:

- To do the experiments (in machines lab) on various power system concepts like determination of sequence impedance, fault analysis, finding of sub transient reactance's.
- 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):

CO1: Get the practical knowledge on calculation of sequence impedance, fault currents, voltages and sub transient reactance's

CO2: Get the practical knowledge on how to draw the equivalent circuit of three winding transformer

CO3: Get the knowledge on development of MATLAB program for formation of Y and Z buses

CO4: Get the knowledge on development of MATLAB programs for Gauss-Seidel and Fast Decouple Load Flow studies

CO5: Get the knowledge on development of SIMULINK model for single area load frequency problem

List of Experiments:

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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	Digital Signal Processing Lab	L	T	P	C
		0	0	3	1.5

III Year 2nd Semester

Course Objectives:

- Implement various DSP Algorithms using software packages.
- Implement DSP algorithms with Digital Signal Processor.
- Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters.
- Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques.
- Analyze digital filters using Software Tools.

Course Outcomes (CO):

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

List of Experiments:

(20A04502P) DIGITAL SIGNAL PROCESSING LAB

Course Outcomes:

- Implement various DSP Algorithms using software packages.
- Implement DSP algorithms with Digital Signal Processor.
- Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters.
- Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques.
- Analyze digital filters using Software Tools.

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

List of Experiments:

1. Generate the following standard discrete time signals.
   i) Unit Impulse ii) Unit step iii) Ramp iv) Exponential v) Sawtooth
2. Generate sum of two sinusoidal signals and find the frequency response (magnitude and phase).
3. Implement and verify linear and circular convolution between two given signals.
4. Implement and verify autocorrelation for the given sequence and cross correlation between two given signals.
5. Compute and implement the N-point DFT of a given sequence and compute the power density spectrum of the sequence.
6. Implement and verify N-point DIT-FFT of a given sequence and find the frequency response (magnitude and phase).
7. Implement and verify N-point IFFT of a given sequence.
8. Design IIR Butterworth filter and compare their performances with different orders (Low Pass Filter /High Pass Filter)
9. Design IIR Chebyshev filter and compare their performances with different orders (Low Pass Filter /High Pass Filter).
10. Design FIR filter (Low Pass Filter /High Pass Filter) using windowing technique.
    i. Using rectangular window
    ii. Using hamming window
    iii. Using Kaiser window
11. Design and verify Filter (IIR and FIR) frequency response by using Filter design and Analysis Tool.
12. Compute the Decimation and Interpolation for the given signal.
13. Real time implementation of an audio signal using a digital signal processor.
14. Compute the correlation coefficient for the two given audio signals of same length using a digital signal processor.

Note: Any TWELVE of the experiments are to be conducted.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	MEASUREMENTS & SENSORS LAB	L	T	P	C
		0	0		1.5

III Year 2nd Semester

Course Objectives:

- Calibration of various electrical measuring instruments
- Accurate determination of inductance and capacitance using AC Bridges
- Measurement of coefficient of coupling between two coupled coils
- Measurement of resistance for different range of resistors using bridges

Course Outcomes (CO):

CO1: Calibrate various electrical measuring instruments
CO2: Accurately determine the values of inductance and capacitance using AC bridges
CO3: Compute the coefficient of coupling between two coupled coils
CO4: Accurately determine the values of very low resistances

List of Experiments:

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer power factor meter
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and voltmeter
4. Kelvin's double Bridge – Measurement of low resistance – Determination of Tolerance
5. Determination of Coefficient of coupling between two mutually coupled coils
6. Determination of Capacitance using Schering Bridge
7. Determination of Inductance using Anderson bridge
8. Measurement of 3-phase reactive power with single-phase wattmeter
9. Measurement of parameters of a choke coil using 3-voltmeter and 3-ammeter methods
10. Determination of Inductance using Maxwell's bridge
11. Determination of Capacitance using DeSauty bridge
12. Calibration of LPF wattmeter – by Phantom loading
13. Wheatstone bridge – measurement of medium resistances
14. LVDT and capacitance pickup – characteristics and Calibration
15. Resistance strain gauge – strain measurement and Calibration
16. Transformer turns ratio measurement using AC Bridge
17. AC Potentiometer – Calibration of AC Voltmeter, Parameters of Choke coil.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	APPLICATIONS OF SOFT COMPUTING TOOLS IN ELECTRICAL ENGINEERING (Skill Oriented Course – IV)	L	T	P	C
		1	0	2	2

III Year 2nd Semester

Course Objectives:

To make the student learn about

- Understand the basic concepts of Electrical Engineering.
- Apply the concepts to design MATLAB models.
- Analyse various Electrical engineering applications through MATLAB.
- Develop real time models using MATLAB.

Course Outcomes (CO):

CO1: Understand the basic concepts of Electrical Engineering

CO2: Apply the concepts to design MATLAB models

CO3: Analyse various Electrical engineering applications through MATLAB

CO4: Develop real time models using MATLAB.

List of Experiments:

Theory:

MATLAB-Introduction, different tool boxes, creation of program files, creation of simulink files, GUI, commonly used blocks, Simpower system toolbox, control system toolbox, Sim Drive lines, Creation of functions, Project implementation through MATLAB

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 Zbus matrix
11. Design of virtual PMU
12. Wide area control of Two area Kundur system

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	Indian Constitution (Mandatory Course-III)	L	T	P	C
		2	0	0	0

III Year 2nd Semester

Course Objectives:

To make the student learn about

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India
- To understand the central and state relation financial and administrative

Course Outcomes (CO):

CO1: Understand historical background of the constitution making and its importance for building a democratic India.

CO2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.

CO3: Understand the value of the fundamental rights and duties for becoming good citizen of India.

CO4: Analyze the decentralization of power between central, state and local self-government.

CO5: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of Human Rights
5. Gain knowledge on roles and functioning of Election Commission

UNIT - I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT - II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

UNIT - III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT - IV

A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

UNIT - V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women.

Reference Books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

4.	D.C. Gupta, Indian Government and Politics
5.	H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6.	J.C. Johari, Indian Government andPolitics Hans
7.	J. Raj IndianGovernment and Politics
8.	M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9.	Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

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 &Electronics Engineering					
IV Year I Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L-T-P**	**Credits**
1		**Professional Elective-III**	PE	3 – 0 - 0	3
2		**Professional Elective-IV**	PE	3 – 0 - 0	3
3		**Professional Elective-V**	PE	3 – 0 - 0	3
4		**Open Elective-III**	OE	3 – 0 - 0	3
5		**Open Elective – IV**	OE	3 – 0 - 0	3
6.		**Humanities Elective**	HS	3 – 0 - 0	3
7.		**Skill oriented course– V** Energy Conservation and Audit	SC	1 – 0-2	2
Evaluation of Summer Internship			PR		3
				Total credits	**23**

List of Professional Electives-III	**List of Professional Electives-V**
1.Power System Operation & Control 2. Switched mode Power Converters 3. Electrical & Electronics Instrumentation	1. Programmable Logic Controllers 2. Linear& Digital IC Applications 3. Embedded Systems
List of Professional Electives-IV	**Humanities Elective**
1. HVDC and FACTS 2. FPGA Based Controller Design 3. Intelligent Control Techniques	1)Entrepreneurship and Design Thinking 2)Management Science 3)Organizational Behavior
List of Open Electives-III & IV Candidate should select the subject from list of subjects offered by other departments.	

Category	**CREDITS**
Professional Elective courses	9
Open Elective Course/Job oriented elective	6
Humanities and Social Science Elective	3
Skill advanced course/soft skill course*	2
Industrial/Research Internship	3
TOTAL CREDITS	**23**

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	POWER SYSTEM OPERATION & CONTROL (Professional Elective Course-III)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

Course Objectives:

- To know about economic load dispatch problems with and without losses in Power Systems
- To distinguish between hydro-electric and thermal plants and coordination between them
- To understand about optimal power flow problems and solving using specified method
- To understand about Automatic Generation Control problems and solutions in Power Systems
- To understand necessity of reactive power control, compensation under no-load and load operation of transmission systems
- To understand about deregulation aspects in Power Systems

Course Outcomes (CO):

CO1: Understand to deal with problems in Power System as Power System Engineer

CO2: Understand to deal with AGC problems in Power System

CO3: Analyze the problems in hydro electric and hydro thermal problems

CO4: Evaluate the complexity of reactive power control problems and to deal with them

CO5: Understand the necessity of deregulation aspects and demand side management problems in the modern power system era.

UNIT - I	**Economic Operation Of Power Systems**

Brief description about electrical power systems, introduction to power system operation and control, Characteristics of various steam units, combined cycle plants, cogeneration plants, Steam units economic dispatch problem with & without considering losses and its solutions, B Matrix loss formula – Numerical problems.

UNIT - II	**Hydro-Thermal Coordination And Optimal Power Flow**

Hydro-thermal Coordination: Characteristics of various types of hydro-electric plants and their models, Introduction to hydro-thermal Coordination, Scheduling energy with hydro-thermal coordination, Short-term hydro-thermal scheduling. **Optimal Power Flow:** 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	**Automatic Generation Control**

Speed governing mechanism, modelling of speed governing mechanism, models of various types of thermal plants (first order), definitions of control area, Block diagram representation of an isolated power system, Automatic Load Frequency control of single area system with and without control, Steady state and dynamic responses of single area ALFC loop, Automatic Load-frequency control of two area system, Tie-line bias control of two area and multi-area system, Static response of two-area system – Numerical examples.

UNIT - IV	**Reactive Power Control**

Requirements in ac power transmission, factors affecting stability & voltage control, fundamental transmission line equation, surge impedance, Natural loading, uncompensated line on open circuit, uncompensated line under load, types of compensations on compensated transmission lines, passive and active compensators, uniformly distributed fixed and regulated shunt compensation, series compensation, compensation by sectioning – Numerical problems.

UNIT - V	**Power Systems 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. Power Generation, Operation and Control, Allen J. Wood and Bruce F. Wollenberg, John Wiley & Sons, Inc., New York, 2nd edition, 1996.
2. Power System Engineering, D P Kothari and I J Nagrath, McGraw Hill Education India Pvt.

Reference Books:

1. Electric Energy Systems Theory: An Introduction, Olle I. Elgerd, TMH Publishing Company Ltd., New Delhi, 2nd edition, 1983.
2. Reactive Power Control in Electric Systems, T J E Miller, John Wiley & Sons, New York, 1982.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	SWITCHED MODE POWER CONVERTERS (Professional Elective Course-III)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

Course Objectives:

To make the student learn about

- 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):

CO1: Understand the problems and to design of various DC-DC converters, advanced converters of SMPCs

CO2: Evaluate the performance of resonant converters

CO3: Analyze the performance characteristics of 1-ϕ and 3-ϕ inverters with single/multi levels, power conditioners, UPS and filters

CO4: 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:

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	ELECTRICAL & ELECTRONICS INSTRUMENTATION (Professional Elective Course-III)	L	T	P	C
		3	0	0	3

IV Year 1st 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):

CO1: Understand Measuring systems, error measurements, test signals, different types of data transmission and modulation techniques

CO2: Analyze various telemetry systems, basic operation of Data acquisition systems, measuring meters and signal analyzers

CO3: Understand Transducers and their measurement of electrical and non-electrical quantities

CO4: Apply the concepts to design various applications of the above

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, Pearson/Prentice Hall of India.,1990.
3. Industrial Instrumentation – Principles and Design by T. R. Padmanabhan, Springer, 3rd re print, 2009

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	HVDC AND FACTS (Professional Elective Course-II)	L	T	P	C
		3	0	0	3

III Year 2nd Semester

Course Objectives:

To make the student learn about

- 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):

CO1: Understand the necessity of HVDC systems as emerging transmission networks

CO2: Understand the necessity of reactive power compensation devices

CO3: Design equivalent circuits of various HVDC system configurations

CO4: 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.

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 Greatz 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:

3. Narain G. Hingorani and Laszlo Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, Wiley-Interscience, New Jersey, 2000.
4. E.W. Kimbark, Direct current transmission, Vol. I, Wiley Interscience, New York, 1971

Reference Books:

5. K R Padiyar, FACTS Controllers in Power Transmission and Distribution, New Age International Publishers, New Delhi, 2007.
6. 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.
7. R Mohan Mathur and Rajiv K Varma, Thyristor-Based FACTS Controllers for Electrical Transmission Systems, IEEE Press, Wiley-Interscience, New Jersey, 2002

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	FPGA BASED CONTROLLER DESIGN (Professional Elective Course-IV)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

Course Objectives:

To make the student learn about

- 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):

- Understand about features of FPGA and its fabrics
- Design of FPGA based systems and develop single and multi FPGA systems
- Apply the basic concepts to design various combinational logic gates using FPGAs
- Develop sequential logic machines and analyze the performance

UNIT I **FPGA ARCHITECTURE AND FABRICS**

Programmable Logic Devices-Types-PLA, PAL, FPGA-architectures, SRAM-based FPGAs, Permanently Programmed 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 & Electronics Engineering

Course Code	INTELLIGENT CONTROL TECHNIQUES (Professional Elective Course-IV)	L	T	P	C
		3	0	0	3

IV Year 1st 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):

CO1: Understand various Intelligent Control Techniques

CO2: Design the controllers and estimators using ANN and Fuzzy Logic

CO3: Apply Evolutionary algorithms suitable to optimize and design a given system specifications

CO4: 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 **Evolutionary Algorithms**

Genetic Algorithm: Introduction - basic concepts, application, Adaptive Neuro-fuzzy Inference System (ANFIS), Neuro-Genetic, Fuzzy-Genetic systems. Ant colony optimization, Particle swarm optimization (PSO) – basic concepts and design procedures.

UNIT V **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;
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 Services Pvt. Ltd.
2. LaurereFauselt, “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 & Electronics Engineering

Course Code	PROGRAMMABLE LOGIC CONTROLLERS (Professional Elective Course-V)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

Course Objectives:

To make the student learn about

- 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):

CO1: Understand different types of PLCs, Its classification and the usage of Easy Veep software

CO2: Analyze the hardware details of Allen Bradley PLC

CO3: Design PLC Programming for various applications

CO4: Apply PLC programming concepts in different fields of Science and Technology

UNIT I **INTRODUCTION TO PLCs**

Introduction: 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 **APPLICATIONS**

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 (Automationdirect 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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	LINEAR & DIGITAL IC APPLICATIONS (Professional Elective Course-V)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

Course Objectives:

To make the student learn about

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of PLL.
- To introduce the concepts of waveform generation and introduce some special function ICs.
- Exposure to digital IC's

Course Outcomes (CO):

CO1: List out the characteristics of Linear and Digital ICs

CO2: Discuss the various applications of linear & Digital ICs

CO3: Solve the application-based problems related to linear and digital ICs

CO4: Analyze various applications based circuits of linear and digital ICs

CO5: Design the circuits using either linear ICs or Digital ICs from the given specifications

UNIT - I	**ICs and OP- AMPS**

INTEGRATED CIRCUITS AND OPERATIONAL AMPLIFIER: Introduction, Classification of IC's, IC chip size and circuit complexity, basic information of Op-Amp IC741 Op-Amp and its features, the ideal Operational amplifier, Op-Amp internal circuit, Op-Amp characteristics - DC and AC.

UNIT - II	**Applications of OP- AMP**

LINEAR APPLICATIONS OF OP-AMP: Inverting and non-inverting amplifiers, adder, subtractor, Instrumentation amplifier, AC amplifier, V to I and I to V converters, Integrator and differentiator. NON-LINEAR APPLICATIONS OF OP-AMP:Sample and Hold circuit, Log and Antilog amplifier, multiplier and divider, Comparators, Schmitt trigger, Multivibrators, Triangular and Square waveform generators, Oscillators

UNIT - III	**Active Filters and other ICs**

ACTIVE FILTERS: Introduction, Butterworth filters – 1st order, 2nd order low pass and high pass filters, band pass, band reject and all pass filters. TIMER AND PHASE LOCKED LOOPS: Introduction to IC 555 timer, description of functional diagram, monostable and astable operations and applications, Schmitt trigger, PLL - introduction, basic principle, phase detector/comparator, voltage controlled oscillator (IC 566), low pass filter, monolithic PLL and applications of PLL.

UNIT - IV	**Voltage Regulators and Converters**

VOLTAGE REGULATOR: Introduction, Series Op-Amp regulator, IC Voltage Regulators, IC 723 general purpose regulators, Switching Regulator.

D to A AND A to D CONVERTERS: Introduction, basic DAC techniques - weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A to D converters - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications

UNIT - V	**Digital ICs**

CMOS LOGIC: CMOS logic levels, MOS transistors, Basic CMOS Inverter, NAND and NOR gates, CMOS AND-OR-INVERT and OR-AND-INVERT gates, implementation of any function using CMOS logic.

COMBINATIONAL CIRCUITS USING TTL 74XX ICS: Study of logic gates using 74XX ICs, Four-bit parallel adder (IC 7483), Comparator (IC 7485), Decoder (IC74138, IC 74154), BCD-to-7-segment decoder (IC 7447), Encoder (IC 74147), Multiplexer (IC 74151), Demultiplexer (IC74154).

SEQUNTIAL CIRCUITS USING TTL 74XX ICS: Flip Flops (IC 7474, IC 7473), Shift Registers, Universal Shift Register (IC 74194), 4- bit asynchronous binary counter (IC 7493).

Textbooks:

1. D. Roy Choudhury, Shail B. Jain, "Linear Integrated Circuit", 4th edition (2012), New Age International Pvt.Ltd., New Delhi, India
2. Ramakant A. Gayakwad, "OP-AMP and Linear Integrated Circuits", 4th edition (2012),Prentice Hall / Pearson Education, New Delhi.
3. Floyd, Jain, "Digital Fundamentals", 8th edition (2009), Pearson Education, New Delhi.

Reference Books:

1. Sergio Franco (1997), Design with operational amplifiers and analog integrated circuits, McGraw Hill, New Delhi.
2. Gray, Meyer (1995), Analysis and Design of Analog Integrated Circuits,Wiley International, New Delhi.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	EMBEDDED SYSTEMS (Professional Elective Course-V)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

Course Objectives:

To make the student learn about

- Understand the concepts of electric vehicles, hybrid electric vehicles and their impact on environment
- Analyze the drive-train topologies and advanced propulsion techniques
- Analyze hybrid energy storage methodologies
- Design suitable power converter topologies for motor control and hybrid energy storage

Course Outcomes (CO):

CO1: Understand the concepts of electric vehicles, hybrid electric vehicles and their impact on environment

CO2: Analyze the drive-train topologies and advanced propulsion techniques

CO3: Analyze hybrid energy storage methodologies

CO4: Design suitable power converter topologies for motor control and hybrid energy storage

UNIT I **Introduction**

Conventional vehicle, basics of vehicle performance, History of electric vehicles, social and environmental importance of electric vehicles, impact of modern drive-trains on energy supplies.

UNIT II **Hybrid Electric Vehicles**

Micro hybrid vehicles, mild hybrid vehicles, full hybrid vehicles, Parallel hybrid vehicles, series Hybrid Vehicles, Series-Parallel Hybrid vehicles ,plug-in hybrid vehicles, power flow diagrams for various operating modes. Plug-in Hybrid Vehicles: Operating principle, architectures: series-parallel-series-parallel, challenges related to grid connection. Range-extended Electric Vehicles: Classification and configurations, Fuel Cell Electric Vehicles, Solar electric Vehicles, Electric Bicycles and their propulsion systems, Vehicle-to-grid, vehicle to-home concepts, Concept of Hybrid Electric Vehicles.

UNIT III **Electric Drive-Trains & Propulsion Unit**

Electric drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis

Electric propulsion unit: Electric components used in electric vehicles, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, Switch Reluctance Motor drives, Drive system efficiency.

UNIT IV **Energy Storage**

Storage requirements for Electric Vehicles, Battery based energy storage, Fuel Cell based energy storage, Super Capacitor based energy storage and their analysis. Power pack management systems, Cell balancing techniques, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices, compressed air storage systems, super conducting magnetic storage systems and Energy management systems.

UNIT V **Converters For Hybrid Energy Storage Systems**

Converter configurations for hybrid energy systems based on Battery and Ultra Capacitors-cascaded converter, multiple parallel-connected converter, dual-active-bridge converter, multiple-input converter,- multiple modes single converter, interleaved converter, switched capacitor converter, converters for coupled inductor based hybridization. Fundamentals of Chargers: Charger classifications and standards, selection of AC charging systems, DC charging systems, Converter topologies for charging, wireless chargers.

Textbooks:

1. Advanced Electric Drive Vehicles, Ali Emadi, CRC Press, Taylor & Francis Group 2015.
2. Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003, 2nd Edition.

Reference Books:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, CRC Press, 2005.
2. Electric Vehicle Technology Explained, James Larminie, John Lowry, Wiley, 2003.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	ENTREPRENEURSHIP AND INCUBATION (Humanities Elective)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

Course Objectives:

To make the student learn about

- To make the student understand about Entrepreneurship
- To enable the student in knowing various sources of generating new ideas in setting up of New enterprise
- To facilitate the student in knowing various sources of finance in starting up of a business
- To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs
- To encourage the student in creating and designing business plans

Course Outcomes (CO):

CO1: Understand the concept of Entrepreneurship and challenges in the world of competition

CO2: Apply the Knowledge in generating ideas for New Ventures

CO3: Evaluate the role of central government and state government in promoting Entrepreneurship

CO4: Create and design business plan structure through incubations.

UNIT - I

Entrepreneurship - Concept, knowledge and skills requirement - Characteristics of successful entrepreneurs - Entrepreneurship process - Factors impacting emergence of entrepreneurship -Differences between Entrepreneur and Intrapreneur - Understanding individual entrepreneurial mindset and personality - Recent trends in Entrepreneurship.

UNIT - II

Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas - Opportunity recognition - Feasibility study - Market feasibility, technical/operational feasibility - Financial feasibility - Drawing business plan - Preparing project report - Presenting business plan to investors.

UNIT - III

Sources of finance - Various sources of Finance available - Long term sources - Short term sources -Institutional Finance – Commercial Banks, SFC's in India - NBFC's in India - their way of financing in India for small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions in aid of entrepreneurship development.

UNIT - IV

Women Entrepreneurship - Entrepreneurship Development and Government - Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available -Women entrepreneurship - Role and importance - Growth of women entrepreneurship in India -Issues & Challenges - Entrepreneurial motivations.

UNIT - V

Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence the Type/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure - Value proposition.

Textbooks:

1. D F Kuratko and T V Rao, "Entrepreneurship**"** - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)
2. Nandan H, " Fundamentals of Entrepreneurship", PHI, 2013

Reference Books:

1. Vasant Desai, "Small Scale Industries and Entrepreneurship", Himalaya Publishing 2012.
2. Rajeev Roy "Entrepreneurship", 2nd Edition, Oxford, 2012.
3. B.JanakiramandM.Rizwana‖ "Entrepreneurship Development: Text & Cases", Excel Books, 2011.
4.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	MANAGEMENT SCIENCE (Humanities 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):

- 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 - Organisational Designs - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

UNIT - II **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

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Reference Books:
1. Koontz &Weihrich, "Essentials of Management", 6th edition, TMH, 2005.
2. Thomas N.Duening& John M.Ivancevich, "Management Principles and Guidelines", Biztantra.
3. Kanishka Bedi, "Production and Operations Management", Oxford University Press, 2004.
4. Samuel C.Certo, "Modern Management", 9th edition, PHI, 2005

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	ENTERPRISE RESOURCE PLANNING (Humanities Elective)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

Course Objectives:

To make the student learn about

- To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning
- To enable the students in knowing the Advantages of ERP
- To train the students to develop the basic understanding of how ERP enriches the
- Business organizations in achieving a multidimensional growth.
- Impart knowledge about the historical background of BPR
- To aim at preparing the students, technologically competitive and make them ready to self-upgrade with the higher technical skills.

Course Outcomes (CO):

CO1: Understand the basic use of ERP Package and its role in integrating business functions

CO2: Explain the challenges of ERP system in the organization

CO3: Apply the knowledge in implementing ERP system for business

CO4: Evaluate the role of IT in taking decisions with MIS

CO5: Create reengineered business processes with process redesign.

UNIT - I

Introduction to ERP: Enterprise – An Overview Integrated Management Information, Business Modeling, Integrated Data Model Business Processing Reengineering(BPR), Data Warehousing, Data Mining, On-line Analytical Processing(OLAP), Supply Chain Management (SCM), Customer Relationship Management(CRM),

UNIT - II

Benefits of ERP: Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Design-making Capability.

UNIT - III

ERP Implementation Lifecycle: Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, Going Live, End-user Training, Post-implementation (Maintenance mode).

UNIT - IV

BPR: Historical background: Nature, significance and rationale of business process reengineering (BPR), Fundamentals of BPR. Major issues in process redesign: Business vision and process objectives, Processes to be redesigned, Measuring existing processes.

UNIT - V

IT in ERP: Role of information technology (IT) and identifying IT levers. Designing and building a prototype of the new process: BPR phases, Relationship between BPR phases. MIS - Management Information System, DSS - Decision Support System, EIS - Executive Information System.

Textbooks:

1. Pankaj Sharma. “Enterprise Resource Planning”. Aph Publishing Corporation, New Delhi, 2004.
2. Alexis Leon, “Enterprise Resource Planning”, IV Edition, Mc.Graw Hill, 2019.

Reference Books:

1. Marianne Bradford “Modern ERP”, 3rd edition.
2.“ERP making it happen Thomas f. Wallace and Michael
3. Directing the ERP Implementation Michael w pelphrey

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	ENERGY CONSERVATION AND AUDIT (Skill oriented course– V)	L	T	P	C
		3	0	0	3

IV Year 1st Semester

Course Objectives:

The following industry relevant skills of the competency 'Undertake energy conservation and energy audit' are expected to be developed in the students by undertaking

- Identification of energy losses and opportunities of energy conservation.
- Implementation of energy conservation technique.
- Apply energy conservation techniques in electrical installations.
- Use Co-generation and relevant tariff for reducing losses in facilities.
- Carryout energy audit for electrical system.

Course Outcomes (CO):

CO1: Understand energy conservation policies in India

CO2: Design energy conservation techniques in electrical machines

CO3: Apply energy conservation techniques in electrical installations, Co-generation and relevant tariff for reducing losses in facilities

CO4: Design and analyze energy audit for electrical system .

Theory:

Different types of Electrical apparatus, ratings, units, Loads, efficiency calculations, power consumption calculations, improvement of p.f., lightening, fans, electricity tariff, need for energy saving, energy audit questionnaire

List of Experiments:

1. Analyze star labeled electrical apparatus and compare the data sheet (Pamphlet) of various star ratings.
2. Determine the '% loading' and the related efficiency of given Induction motor at different loading
3. Determine the reduction in power consumption in star mode operation of Induction motor compared to delta mode at no load/ light loads.
4. Use APFC / PFC unit for improvement of p. f. of electrical load.
5. Compare power consumption of (Fluorescent and LED) lighting
6. Determine Net Energy Saving by Lamp replacements.
7. Determine Energy conservation in Fan by using Electronic Regulator
8. Analysis of electric bill based on tariff of Industrial consumer to reduce energy usage and electric bill
9. To analyze the energy bill of a commercial consumer and to suggest (if needed) suitable tariff to achieve energy conservation and reduction in energy bill
10. To interpret the energy bill of a residential consumer, suggest suitable tariff to achieve energy conservation and reduction in energy bill.
11. Estimate energy saving by improving power factor and load factor for given cases.
12. Prepare a sample energy audit questionnaire for the given industrial facility.
13. Prepare an energy audit report
14. Determination of rating of Inverter capacity for household applications

Reference Books:

1. Guide Books no. 1 and 3 for National Certification Examination for Energy Managers and Energy Auditors Energy Management and Conservation By Sharma, K. V., Venkataseshaiah P

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 &Electronics Engineering					
IV Year II Semester					
S.No	**Course Code**	**Course Name**	**Category**	**L – T-P**	**Credits**
1.		Full Internship & Project work	PROJ	0 – 0-0	12
Total credits					**12**

Category	**CREDITS**
Full Internship & Project work	**12**
TOTAL CREDITS	**12**

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Open Electives offered by Dept. of E.E.E to other Departments

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

LIST OF OPEN ELECTIVES

Open Electives offered by Dept. of E.E.E(Offered to other Departments)

1.Electrical circuit Theory (OE-1)
2.Generation of Electric Power (OE-2)
3.Renewable Energy Sources (OE-3)
4.Basics of Power Electronics (OE-4)

O**ut of Open elective courses at least one course should be completed through MOOCs**

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	ELECTRICAL CIRCUIT THEORY (Open Elective – I)	L	T	P	C
		3	1	0	4

Course Objectives:

The objectives of this course is to acquire knowledge on

- Concepts of passive elements, types of sources and various network reduction techniques and applications of electrical circuits.
- Behavior of RLC networks for sinusoidal excitations.
- Performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
- Applications of network theorems for analysis of electrical networks.
- concepts of balanced and unbalanced three-phase circuits

Course Outcomes (CO):

CO1: analyze various electrical networks in presence of active and passive elements

CO2: explore RLC networks with sinusoidal excitation.

CO3: analyze resonance conditions in electrical circuits.

CO4: verify various network theorems.

CO5: solve three- phase circuits under balanced and unbalanced condition.

UNIT - I — **Introduction to Electrical Circuits**

Basic Concepts of active and passive elements and their V-I relations, Sources (dependent and independent), Kirchhoff'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, Super node and Super mesh analysis, Principles of Duality.

UNIT - II — **Single Phase A.C Systems**

Periodic waveforms (determination of rms, average value, peak factor and form factor), concept of phase angle, phase difference – waveforms and phasor diagrams, lagging and leading networks, rectangular and polar forms of representations, steady state analysis of R, RL and RC circuits, power factor and its significance, real, reactive and apparent power, waveforms of instantaneous power and complex power.

UNIT - III — **Analysis of AC Networks**

Extension of node and mesh analysis to AC networks, numerical problems on sinusoidal steady state analysis, series and parallel resonance, selectivity, band width and Quality factor, Current Locus diagrams of RL, RC and RLC circuits.

UNIT - IV — **Network theorems (DC & AC Excitations)**

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum-power transfer theorem,Reciprocity theorem, Millman's theorem, Tellegen's theorem and Compensation theorem.

UNIT - V — **Balanced and Unbalanced Three phase circuits**

Phase sequence, star and delta connection of sources and loads, relation between line and phasvoltages and currents, 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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Textbooks:
1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company, 6th edition.
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.
Reference Books:
1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India).
2. Linear Circuit Analysis by De Carlo, Lin, Oxford publications.
3. Electric Circuits – (Schaum's outlines) by Mahmood Nahvi & Joseph Edminister, adapted by K. Uma Rao, 5th Edition – McGraw Hill.
4. Electric Circuits by David A. Bell, Oxford publications.
5. Introductory Circuit Analysis by Robert L Boylestad, Pearson Publications.
6. Circuit Theory (Analysis and Synthesis) by A.Chakrabarthi, Dhanpat Rai&Co.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	GENERATION OF ELECTRIC POWER (Open Elective – II)	L	T	P	C
		3	1	0	4

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):

CO1 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.

CO2 Analyze the construction, working and operating principle, and essential components of Hydro and Nuclear power generating stations.

CO3 Analyze the different methods and characteristics of solar, wind, biogas, geothermal and ocean power generating systems along with their economic and environmental aspects.

CO4 Carry out a detailed analysis on the economic aspects of power generation involving various tariff methods 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 NuclearReactor.-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 AxisWind 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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

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.
3. 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

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	RENEWABLE ENERGY SOURCES (Open Elective -III)	L	T	P	C
		3	0	0	3

Course Objectives:

To make the student learn about

- basics of energy systems, solar energy and solar thermal Systems
- solar photo voltaic systems construction characteristics and design
- wind energy conversion systems, Betz coefficient, tip speed ratio and maximum power point techniques of wind energy
- basic principle and working of hydro, tidal
- basic principle and working of different fuel cells, biomass digesters and geothermal systems

Course Outcomes(CO):

CO1: analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface solar thermal collectors, solar thermal plants

CO2: design solar photo voltaic systems, maximum power point techniques in solar pv

CO3: develop wind energy conversion systems, wind generators, power generation and wind energy systems

CO4: explain basic principle and working of hydro, tidal energy sytems

CO5: explain biomass, fuel cell and geothermal systems.

UNIT-I	**Fundamentals of Energy Systems, Solar Energy and Solar Thermal Systems**

Energy conservation principle – Energy scenario (world and India) – various forms of renewable energy - Solar radiation: Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces -Liquid flat plate collectors: Performance analysis –Transmissivity– Absorptivity product collector efficiency factor – Collector heat removal factor. Introduction to solar air heaters – Concentrating collectors, solar pond and solar still – solar thermal plants

UNIT-II	**Solar Photovoltaic Systems**

Solar photovoltaic cell, module, array – construction – Efficiency of solar cells – Developing technologies – Cell I-V characteristics – Equivalent circuit of solar cell – Series resistance – Shunt resistance – Applications and systems – Balance of system components - System Design: storage sizing – PV system sizing – Maximum power point techniques: Perturb and observe (P&O) technique – Hill climbing technique

UNIT-III	**Wind Energy**

Sources of wind energy - Wind patterns – Types of turbines –Horizontal axis and vertical axis machines - Kinetic energy of wind – Betz coefficient – Tip–speed ratio – Efficiency – Power output of wind turbine – Selection of generator (synchronous, induction) – Maximum power point tracking – wind farms – Power generation for utility grids.

UNIT-IV	**Hydro and Tidal power systems**

Basic working principle – Classification of hydro systems: Large, small, micro – measurement of head and flow – Energy equation – Types of turbines – Numerical problems. Tidal power – Basics – Kinetic energy equation – Turbines for tidal power - Numerical problems – Wave power – Basics – Kinetic energy equation – Wave power devices – Linear generators

UNIT-V	**Biomass, fuel cells and geothermal systems**

Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing. Fuel cell: Classification of fuel for fuel cells – Fuel cell voltage– Efficiency – V-I characteristics. Geothermal: Classification – Dry rock and hot acquifer – Energy analysis – Geothermal based electric power generation

Textbooks:

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition
2. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis -second edition,2013

Reference Books:

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

1. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford University Press.
2. Renewable Energy- Edited by Godfrey Boyle-oxford university. press,3rd edition,2013
3. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa
5. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI
6. Non-conventional energy source –B.H.khan- TMH-2 nd edition

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	BASICS OF POWER ELECTRONICS (Open Elective – IV)	L	T	P	C
		3	0	0	3

Course Objectives:

The objectives of this course is to acquire knowledge on

- Characteristics of various power semiconductor devices and analyze the operation of silicon-controlled rectifier.
- Operation of half-wave and full-wave phase-controlled rectifiers and analyze harmonics in the input current.
- 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

Co1: Draw the characteristics of various power semiconductor devices and analyze the operation of silicon-controlled rectifier.

Co2: Analyze the operation of half-wave and full-wave phase-controlled rectifiers and harmonics in the input current.

Co3: Explain the operation of three phase full converter and dual converter.

Co4: Explain the operation of AC voltage controller, single phase cyclo converter and high frequency dc-dc converters.

Co5: 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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

HONOURS DEGREE IN EEE

Note

1.A student can opt any Four subjects @ 4 credits per subject

2.Concerned BoS can add or delete the subjects as per the decision of the board.

3.Prerequisites to be defined by the board for each course.

4.Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each

S.No.	Course No.	Course Name	L	T	P	Credits
1.		Advance Power Electronics	3	1	0	4
2.		Distributed Generation & Micro Grids	3	1	0	4
3.		Battery Management Systems	3	1	0	4
4.		Grid Integration of Renewable Energy Systems	3	1	0	4
5		MOOC course Introduction to Hybrid and Electric vehicles	0	0	0	2
6		MOOC course Neural Networks for Signal Processing - I	0	0	0	2

Course Code	ADVANCE POWER ELECTRONICS (HONORS – I)	L	T	P	C

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

		3	**1**	**0**	**4**

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):

CO1: analyze and design resonant converters
CO2: develop power converter models under steady state and small signal conditions
CO3: application of current mode control of power converters
CO4: design feedback control systems for power converters
CO5: 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.

	DISTRIBUTED GENERATION & MICRO GRIDS	**L**	**T**	**P**	**C**

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	(HONORS – II)				
		3	1	0	4

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):

CO1: Find the size and optimal placement DG
CO2: Analyze the impact of grid integration and control aspects of DG's
CO3: Analyze the operational issues of the DG's to be connected in the system
CO4: Describe the technical impacts of DG's in power systems
CO5: 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:

4. Abraham I. Pressman, Keith Billings &Taylor Morey: Switching Power Supply Design, McGraw Hill International, 3rd Edition, 2009.
5. R.W. Erickson and Dragan Maksimonic: Fundamentals of Power Electronics, Springer, 2nd Edition, 2001.
6. Umanand, L., Power Electronics: Essentials and Applications, John Wiley India, 1st Edition, 2009.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	BATTERY MANAGEMENT SYSTEMS (HONORS –III)	L	T	P	C
		3	1	0	4

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:

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 VDESIGN 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:

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	GRID INTEGRATION OF RENEWABLE ENERGY SYSTEMS (HONORS – IV)	L	T	P	C
		3	1	0	4

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):

CO1: explain operation and control on the issues related to the integration of distributed renewable generation into the network.

CO2 analysis of stability in power system integration using synchronous generators and induction generators.

CO3: determine challenges and issues in integration of renewable sources

CO4: interpret the load scheduling and dispatch

CO5 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

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

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

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

MINORS DEGREE IN EEE

Note

1.A student can opt any Four subjects @ 4 credits per subject
2.Concerned BoS can add or delete the subjects as per the decision of the board.
3.Prerequisites to be defined by the board for each course.
4.Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each)

S.No	Course Code	Course Name	L	T	P	Credits
1.		DC Machines	3	1	0	4
2.		AC Machines	3	1	0	4
3.		Electrical Measurements & instrumentation	3	1	0	4
4.		Basics of Control systems	3	1	0	4
5		MOOC Course (8 Weeks) Renewable Energy sources	0	0	0	2
6		MOOC Course (8 Weeks) Power System Engineering	0	0	0	2

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	DC MACHINES (MINORS – I)	L	T	P	C
		3	1	0	4

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):

CO1: Able to understand the electromechanical energy conversion system.
CO2: Able to understand the construction, operation and armature windings of a DC generator.
CO3: Able to analyze parallel operation of DC Generators.
CO4: Able to analyze speed control of DC motors, testing methods and parallel operation of DC machines.
CO5: 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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

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.

Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu – 515 003 (A.P) India

Electrical & Electronics Engineering

Course Code	AC MACHINES (MINORS – II)	L	T	P	C
		3	1	0	4

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:

CO1: 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.

CO2: Predetermine the regulation of a three-phase alternator by synchronous impedance & m.m.f methods.

CO3: Predetermine the regulation of Alternator by Zero Power Factor method Xd and Xq determination of salient pole synchronous machine.

CO4: 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, performancecharacteristics, 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.

References:

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.

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

Electrical & Electronics Engineering

Course Code	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION (MINORS – III)	L	T	P	C
		3	1	0	4

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

Co1: Compare the different types of measuring instruments, their construction, operation and characteristics.

Co2: Measure the voltage and current through potentiometers and instrument transformers

Co3: Choose the suitable method for measurement of active, reactive powers and energy.

Co4: Apply the suitable method for measurement of resistance, inductance and capacitance.

Co5: 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.
   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

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

Course Code	BASICS OF CONTROL SYSTEMS (MINORS – IV)	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

Co1: Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.

Co2: 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

Co3: Analyze the stability of LTI systems using frequency response methods.

Co4: Design lag, lead, lag-lead compensators to improve system performance from bode diagrams.

Co5: 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

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

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.
   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