



Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu-515003(A.P) India

Electrical & Electronics Engineering

**Draft Academic Regulations of M.Tech. (Full Time/Regular) Programme
(Effective for the students admitted into M.Tech. I year from the Academic Year 2024-25 onwards)**

Sri Krishnadevaraya University College of Engineering & Technology offers **Two Years (Four Semesters)** full-time Master of Technology (M.Tech.) Degree programme, under Choice Based Credit System (CBCS) in different branches of Engineering and Technology with different specializations.

Sri Krishnadevaraya University College of Engineering & Technology, Ananthapuramu shall confer M. Tech. degree on candidates who are admitted to the programme and fulfill all the requirements for the award of the degree.

1. Award of the M.Tech. Degree

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

- 1.1 Pursues a course of study for not less than two academic years and not more than four academic years.
- 1.2 Registers for 70 credits and secures all 70 credits.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within four academic years from the year of their admission, shall forfeit their seat in M.Tech. course and their admission stands cancelled.

3. Programme of Study:

The following M.Tech. Specializations are offered at present in different branches of Engineering and Technology:

S.No	Branch	Name of the Specialization
01	Computer Science and Engineering	Computer Science and Engineering
02	Electronics and Communication Engineering	Embedded Systems & VLSI Design
03	Electrical and Electronics Engineering	Electrical Power Systems

4. Eligibility for Admissions:

- 4.1 Admission to the M. Tech Program shall be made subject to the eligibility, qualification and specialization prescribed by the A.P. State Government/University from time to time.
- 4.2 Admissions shall be made either on the basis of the merit rank or Percentile obtained by the qualified student in the relevant qualifying GATE Examination/ the merit rank obtained by the qualified student in an entrance test conducted by A.P. State Government (APPGECET) for M.Tech. programmes/an entrance test conducted by University/on the basis of any other exams approved by the University, subject to reservations as laid down by the Govt. from time to time.

5. Programme related terms:

- 5.1 **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.
Credit definition:



Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu-515003(A.P) India

Electrical & Electronics Engineering

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

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

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

6. Programme Pattern:

6.1 Total duration of the of M.Tech. programme is two academic years

6.2 Each academic year of study is divided into two semesters.

6.3 Each Semester shall be of 22 weeks duration (inclusive of Examinations), with a minimum of 90 instructional days per semester.

6.4 The student shall not take more than four academic years to fulfill all the academic requirements for the award of M.Tech. degree from the date of commencement of first year first semester, failing which the student shall forfeit the seat in M.Tech. programme.

6.5 The medium of instruction of the programme (including examinations and project reports) will be in English only.

6.6 All subjects/courses offered for the M.Tech. degree programme are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Core Courses	Foundational & Professional Core Courses (PC)	Includes subjects related to the parent discipline/department/branch of Engineering
2.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline which are of importance in the context of special skill development
3.	Research	Research methodology & IPR	To understand importance and process of creation of patents through research
		Technical Seminar	Ensures preparedness of students to undertake major projects/Dissertation, based on core contents related to specialization
		Cocurricular Activities	Attending conferences, scientific presentations and other scholarly activities



Sri Krishnadevaraya University College of Engineering & Technology

Ananthapuramu-515003(A.P) India

Electrical & Electronics Engineering

		Dissertation	M.Tech. Project or Major Project
4.	Audit Courses	Mandatory noncredit courses	Covering subjects of developing desired attitude among the learners is on the line of initiatives such as Unnat Bharat Abhiyan, Yoga, Value education etc.

- 6.7 The college shall take measures to implement Virtual Labs (<https://www.vlab.co.in>) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.
- 6.8 A faculty advisor/mentor shall be assigned to each specialization to advise students on the programme, its Course Structure and Curriculum, Choice of Courses, based on his competence, progress, pre-requisites and interest.
- 6.9 Preferably 25% course work for the theory courses in every semester shall be conducted in the blended mode of learning.

7. Attendance Requirements:

- 7.1 A student shall be eligible to appear for the University external examinations if he/she acquires 75% of attendance in aggregate of all the courses.
- 7.2 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.
- 7.3 Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence
- 7.4 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class.
- 7.5 A stipulated fee shall be payable towards condonation of shortage of attendance.
- 7.6 A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek re-admission into that semester when offered next.
- 7.7 If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
- 7.8 If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

8. Evaluation – Distribution and Weightage of Marks:

The performance of a student in each semester shall be evaluated subject - wise (irrespective of credits assigned), for a maximum of 100 marks for theory and 100marks for practical, based on Internal Evaluation and End Semester Examination.

- 8.1 There shall be five units in each of the theory subjects. For the theory subjects 60 marks will be for the End Examination and 40 marks will be for Internal Evaluation.
- 8.2 Two Internal Examinations shall be conducted for 30 marks each, one in the middle of the Semester and the other immediately after the completion of instruction. First mid examination shall be conducted for I & II units of the syllabus and second mid examination for III, IV & V units. Each mid exam shall be conducted for a total duration of 120 minutes with 3 questions (without choice) each question for



- 10 marks. Final Internal marks for a total of 30 marks shall be arrived at by considering the marks secured by the student in both the internal examinations with 80% weightage to the better internal exam and 20% to the other. There shall be two online examinations conducted during the respective mid examinations by the college for the remaining 10 marks with 20 objective questions.
- 8.3 The following pattern shall be followed in the End Examination:
- Five questions shall be set from each of the five units with either/or type for 12 marks each.
 - All the questions have to be answered compulsorily.
 - Each question may consist of one, two or more bits.
- 8.4 For practical subjects, 60 marks shall be for the End Semester Examinations and 40 marks will be for internal evaluation based on the day-to-day performance. The internal evaluation based on the day-to-day work-10 marks, record- 10 marks and the remaining 20 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with a breakup mark of Procedure-10, Experimentation-25, Results-10, Viva- voce-15
- 8.5 There shall be a **Technical Seminar** during I year II semester for internal evaluation of 100 marks. A student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other faculty members of the department. The student must secure a minimum of 50% of marks, to be declared successful. If he fails to obtain the minimum marks, he must reappear for the same as and when supplementary examinations are conducted. The Technical seminar shall be conducted anytime during the semester as per the convenience of the Project Review Committee and students. There shall be no external examination for Technical Seminar.
- 8.6 There shall be Mandatory **Audit courses** in I & II semesters for zero credits. There is no external examination for audit courses. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 50% or more in the internal examinations. In case, the student fails, a re- examination shall be conducted for failed candidates for 40 marks every six months/semester satisfying the conditions mentioned in item 1 & 2 of the regulations.
- 8.7 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.
- 8.8 In case the candidate does not secure the minimum academic requirement in any of the subjects he/she has to reappear for the Semester Examination either supplementary or regular in that subject or repeat the course when next offered or do any other specified subject as may be required.
- 8.9 The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms.

9. Credit Transfer Policy

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



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

Online Learning courses through SWAYAM.

- 9.1 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.
- 9.2 The online learning courses available on the SWAYAM platform will be considered for credit transfer. SWAYAM course credits are as specified in the platform
- 9.3 Student registration for the MOOCs shall be only through the institution, it is mandatory for the student to share necessary information with the institution
- 9.4 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 curriculum in the offline mode.
- 9.5 The institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer in the forthcoming Semester.
- 9.6 The institution shall also ensure that the student has to complete the course and produce the course completion certificate as per the academic schedule given for the regular courses in that semester
- 9.7 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.
- 9.8 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.
- 9.9 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.
- 9.10 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.
- 9.11 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.

10. Re-registration for Improvement of Internal Evaluation Marks:

A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and has failed in the end examination

- 10.1 The candidate should have completed the course work and obtained examinations results for I, II and III semesters.
- 10.2 The candidate should have passed all the subjects for which the Internal Evaluation marks secured are more than 50%.
- 10.3 Out of the subjects the candidate has failed in the examination due to Internal Evaluation marks secured being less than 50%, the candidate shall be given one chance for each Theory subject and for a maximum of three Theory subjects for



- Improvement of Internal evaluation marks.
- 10.4 The candidate has to re-register for the chosen subjects and fulfill the academic requirements.
 - 10.5 For reregistration the candidates have to apply to the University through the college by paying the requisite fees and get approval from the University before the start of the semester in which re-registration is required
 - 10.6 In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for the reregistered subjects stand cancelled.

11. Evaluation of Project/Dissertation Work:

The Project work shall be initiated at the beginning of the III Semester and the duration of the Project is of two semesters. Evaluation of Project work is for 300 marks with 200 marks for internal evaluation and 100 marks for external evaluation. Internal evaluation of the Project Work – I & Project work – II in III & IV semesters respectively shall be for 100 marks each. External evaluation of final Project work viva voce in IV semester shall be for 100 marks.

A Project Review Committee (PRC) shall be constituted with the Head of the Department as Chairperson, Project Supervisor and one faculty member of the department offering the M.Tech. programme.

- 11.1 A candidate is permitted to register for the Project Work in III Semester after satisfying the attendance requirement in all the subjects, both theory and laboratory (in I & II semesters).
- 11.2 A candidate is permitted to submit Project dissertation with the approval of PRC. The candidate has to pass all the theory, practical and other courses before submission of the Thesis.
- 11.4 Project work shall be carried out under the supervision of teacher in the parent department concerned.
- 11.5 A candidate shall be permitted to work on the project in an industry/research organization on the recommendation of the Head of the Department. In such cases, one of the teachers from the department concerned would be the internal guide and an expert from the industry/ research organization concerned shall act as co-supervisor/ external guide. It is mandatory for the candidate to make full disclosure of all data/results on which they wish to base their dissertation. They cannot claim confidentiality simply because it would come into conflict with the Industry's or R&D laboratory's own interests. A certificate from the external supervisor is to be included in the dissertation.
- 11.6 Continuous assessment of Project Work - I and Project Work – II in III & IV semesters respectively will be monitored by the PRC.
- 11.7 The candidate shall submit status report by giving seminars in three different phases (two in III semester and one in IV semester) during the project work period. These seminar reports must be approved by the PRC before submission of the Project Thesis.
- 11.8 After registration, a candidate must present in Project Work Review - I, in consultation with his Project Supervisor, the title, objective and plan of action of his Project work to the PRC for approval within four weeks from the commencement of III Semester. Only after obtaining the approval of the PRC can the student initiate the project work.



- 11.9 The Project Work Review - II in III semester carries internal marks of 100. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Project Work.
- 11.10 A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review - II. Only after successful completion of Project Work Review – II, candidate shall be permitted for Project Work Review – III in IV Semester. The unsuccessful students in Project Work Review - II shall reappear for it as and when supplementary examinations are conducted.
- 11.11 The Project Work Review - III in IV semester carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The PRC will examine the overall progress of the Project Work and decide whether or not eligible for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review - III. If he fails to obtain the required minimum marks, he has to reappear for Project Work Review - III after a month.
- 11.12 For the approval of PRC the candidate shall submit the draft copy of dissertation to the Head of the Department and make an oral presentation before the PRC.
- 11.13 After approval from the PRC, the students are required to submit a report showing that the plagiarism is within 30%. The dissertation report will be accepted only when the plagiarism is within 30%, which shall be submitted along with the dissertation report.
- 11.14 Research paper related to the Project Work shall be published in conference proceedings/UGC recognized journal. A copy of the published research paper shall be attached to the dissertation.
- 11.15 After successful plagiarism check and publication of research paper, three copies of the dissertation certified by the supervisor and HOD shall be submitted to the College.
- 11.16 The dissertation shall be adjudicated by an external examiner selected by the University. For this, the Principal of the College shall submit a panel of three examiners as submitted by the supervisor concerned and department head for each student. However, the dissertation will be adjudicated by one examiner nominated by the University.
- 11.17 If the report of the examiner is not satisfactory, the candidate shall revise and resubmit the dissertation, in the time frame as decided by the PRC. If report of the examiner is unfavorable again, the thesis shall be summarily rejected. The candidate has to reregister for the project and complete the project within the stipulated time after taking the approval from the University
- 11.18 If the report of the examiner is satisfactory, the Head of the Department shall coordinate and make arrangements for the conduct of Project Viva voce exam.
- 11.19 The Project Viva voce examinations shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who has adjudicated the dissertation. For Dissertation Evaluation (Viva voce) in IV Sem. there are external marks of 100 and it is evaluated by external examiner. The candidate must secure a minimum of 50% marks in Viva voce exam.
- 11.20 If he fails to fulfill the requirements as specified, he will reappear for the Project Viva voce examination only after three months. In the reappeared examination also, if he fails to fulfill the requirements, he will not be eligible for the award of the degree.



12. Credits for Co-curricular Activities

The credits assigned for co-curricular activities shall be given by the principals of the colleges and the same shall be submitted to the University.

A Student shall earn 02 credits under the head of co-curricular activities, viz., attending Conference, Scientific Presentations and Other Scholarly Activities.

Following are the guidelines for awarding Credits for Co-curricular Activities

Name of the Activity	Maximum Credits / Activity
Participation in National Level Seminar/ Conference / Workshop /Training programs (related to the specialization of the student)	1
Participation in International Level Seminar / Conference / workshop/Training programs held outside India (related to the specialization of the student)	2
Academic Award/Research Award from State Level/National Agencies	1
Academic Award/Research Award from International Agencies	2
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	1
Research / Review Publication in International Journals with Editorial board outside India (Indexed in Scopus / Web of Science)	2

Note:

- i) Credit shall be awarded only for the first author. Certificate of attendance and participation in a Conference/Seminar is to be submitted for awarding credit.
- ii) Certificate of attendance and participation in workshops and training programs (Internal or External) is to be submitted for awarding credit. The total duration should be at least one week.
- iii) Participation in any activity shall be permitted only once for acquiring required credits under cocurricular activities

13. Grading:

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

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

Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points Assigned
≥ 90	S (Superior)	10
≥ 80 & < 90	A (Excellent)	9
≥ 70 & < 80	B (Very Good)	8
≥ 60 & < 70	C (Good)	7
≥ 50 & < 60	D (Pass)	6
< 50	F (Fail)	0



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

Table with 3 columns: Absent, Ab (Absent), 0

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 in the next supplementary examination.

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

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

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

SGPA = Σ (Ci × Gi) / Σ Ci

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

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

CGPA = Σ (Ci × Si) / Σ Ci

where "Si" is the SGPA of the i^th semester and Ci is the total number of credits of i^th semester.

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

14. Award of Class:

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

Table with 2 columns: Class Awarded, Percentage of Marks to be secured. Rows include First Class with Distinction (≥70%), First Class (<70% ≥60%), and Pass Class (<60% ≥50%).

- 15. Exit Policy: The student shall be permitted to exit with a PG Diploma based on his/her request to the university through the institution at the end of first year subject to passing all the courses in first year.

The University shall resolve any issues that may arise in the implementation of this policy



from time to time and shall review the policy in the light of periodic changes brought by UGC, AICTE and State government.

16. Withholding of Results:

If the candidate has any case of in-discipline pending against him, the result of the candidate shall be withheld, and he will not be allowed/promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

17. Transitory Regulations

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

18. General:

- 18.1 The academic regulations should be read for purpose of any interpretation.
- 18.2 Disciplinary action for Malpractice/improper conduct in examinations is appended.
- 18.3 Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- 18.4 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- 18.5 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the University.



**RULES FOR
DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN
EXAMINATIONS**

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
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 University 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 University examinations if his involvement is established. Otherwise, the candidate is debarred for two consecutive semesters from class work and all University 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 University 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 thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University 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



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

Table with 3 columns: S.No., Description, and Action. Row 10: Comes in a drunken condition to the examination hall. Row 11: Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny. Row 12: If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.

- 1. Malpractices identified by squad or special invigilators
2. Punishments to the candidates as per the above guidelines.
3. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
4. A show cause notice shall be issued to the college.
5. Impose a suitable fine on the college.
6. Shifting the examination center from the college to another college for a specific period of not less than one year.

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 fulfil all the norms required for the award of Degree.



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

SKUCET Curriculum
M.Tech Course Structure – R24
ELECTRICAL POWER SYSTEMS(EPS)

Semester – I					
Electrical Power Systems (EPS)					
S.No	Course Code	Course Name	Category	L-T-P	Credits
1		Advanced Power System Protection	PC	3-0-0	3
2		Power System Security and State Estimation	PC	3-0-0	3
3		Program Elective I: i. Machine Learning Application to Power systems ii. Modelling and Analysis of HVDC Systems iii. Power System Optimization	PE	3-0-0	3
4		Program Elective II: i. Solar & Wind Energy Conversion Systems ii. Smart Grid Technologies iii. Electric Vehicle Engineering	PE	3-0-0	3
5		Machines & Power Systems Lab	PC	0-0-4	2
6		Power Systems Simulation Lab	PC	0-0-4	2
7		Research Methodology and IPR	MC	2-0-0	2
8		Audit Course – I English for Research paper writing Disaster Management Sanskrit for Technical Knowledge	AC	2-0-0	0
TOTAL					18



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Sri Krishnadevaraya University College of Engineering & Technology					
Electrical Power Systems (EPS)					
Semester – II					
S.No	Course Code	Course Name	Category	L-T-P	Credits
1.		Power System Planning and Control	PC	3-0-0	3
2.		FACTS Controllers	PC	3-0-0	3
3.		Program Elective III: i. Power System Wide Area Monitoring & Control ii. Modern Control Theory iii. Reactive power Compensation & Management.	PE	3-0-0	3
4.		Program Elective IV: i. Power Quality ii. Distributed Generation and Micro grid Control iii. EHVAC Transmission systems	PE	3-0-0	3
5.		Renewable Energy Systems Lab	PC	0-0-4	2
6.		FACTS Devices & Simulation Lab	PC	0-0-4	2
7.		Technical Seminar	MC	2-0-0	2
8.		Audit Course – II Pedagogy Studies Stress Management for Yoga Personality Development through Life Enlightenment Skills	AC	2-0-0	0
TOTAL					18



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

Sri Krishnadevaraya University College of Engineering & Technology					
Electrical Power Systems (EPS)					
Semester – III					
S.No	Course Code	Course Name	Category	L-T-P	Credits
1.		Program Elective – V i. Restructured power systems ii. Risk Assessment of Electrical Power Systems iii. Power System Automation	PE	3-0-0	3
2.		Open Elective Industrial Safety Business Analytics Waste to Energy	OE	3-0-0	3
3.		Dissertation Phase – I	PR	0-0-20	10
4.		Co-curricular Activities			2
TOTAL					18

Sri Krishnadevaraya University College of Engineering & Technology					
Electrical Power Systems (EPS)					
Semester – IV					
S.No	Course Code	Course Name	Category	L-T-P	Credits
1.		Dissertation Phase – II	PR	0-0-32	16
TOTAL					16



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		ADVANCED POWER SYSTEM PROTECTION	L	T	P	C
Semester	I		3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> To know construction of static relays. To understand the operation of amplitude and phase comparators. To comprehend the concepts of Static over current, static differential and static distance relays. To understand multi-input comparators and concept of power swings on the distance relays. To know the operation of microprocessor based protective relays. 						
Course Outcomes (CO): Student will be able to						
<p>CO 1: Describe the construction of static relay and identify the advantages of static relay over electromagnetic relay and analyze the importance of reliability in various fields.</p> <p>CO 2: Explore the operation of rectifier bridge comparators, instantaneous comparators, phase comparators, multi input comparators, static differential and distance relays.</p> <p>CO 3: Describe instantaneous, definite time and inverse definite minimum time over current relays.</p> <p>CO 4: Analyze the concept of power swings on distance relays and to identify the microprocessor based protective relays and their operation.</p>						
UNIT – I	STATIC RELAYS & COMPARATORS					Lecture Hrs: 8
Introduction to Static relays - Basic construction of Static relays – Level detectors – Replica Impedance-Mixing circuits-General equation for two input phase and Amplitude Comparators – their types – Duality between Amplitude and Phase Comparator –Conic section characteristics–Three input Amplitude Comparator – Hybrid comparator – Switched distance schemes – Polyphase distance schemes-Phase faults scheme –Three phase scheme–Combined and Ground fault scheme.						
UNIT - II	TYPES OF STATIC RELAYS					Lecture Hrs:9
Introduction-Instantaneous over current relay – Time over current relays - Basic principles - Definite time and Inverse definite time over current relays, directional over current relays - Static Differential Relays-Analysis of static differential relays–Static relay schemes-Dual bias transformer differential protection – Harmonic restraint relay.						
UNIT - III	NUMERICAL RELAYS					Lecture Hrs: 9
Advantages of Numerical Relays – Numerical network-Digital Signal processing–Estimation of Phasors – Full Cycle Fourier Algorithm – Half Cycle Fourier Algorithm- practical considerations for selection of Algorithm–Discrete Fourier Transform						
UNIT - IV	DISTANCE RELAYS AND POWER SWINGS					Lecture Hrs: 12
Static Distance Relays - Static Impedance - reactance - MHO and Angle Impedance relay sampling comparator – Realization of reactance and MHO relay using a sampling comparator. Effect of power swings on the performance of Distance relays- Power swing analysis - Principle of out of step tripping and blocking relays - Effect of line length and source impedance on distance relays.						
UNIT - V	MICROPROCESSOR BASED PROTECTIVE RELAYS					Lecture Hrs: 10
Over current relays – Impedance relays – Directional relay – Reactance relay (Block diagram and flowchart approach only). Generalized mathematical expression for distance relays-Measurement of resistance and reactance – MHO and offset MHO relays – Realization of MHO characteristics – Realization of Offset MHO characteristics (Block diagram and flow chart approach only) - Basic principle of Digital computer relaying.						
Textbooks:						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

1. T.S. Madhava Rao, Power system Protection static relay, Tata McGrawHill Publishing Company limited, 2nd Edition, 2004.
2. Badri Ram and D.N. Vishwakarma, Power system Protection and Switchgear, Tata McGraw Hill Publication Company limited, 2nd Edition, 2013.

Reference Books:

1. Bhavesh Bhalja, R. P. Maheshwari, N. G. Chothani, Protection and Switchgear, Oxford University Press, 2nd Edition, New Delhi, India, 2018.
2. Oza, B. A., N. C. Nair, R. P. Mehta, et al., Power System Protection & Switchgear, Tata McGraw Hill, New Delhi, 1st Edition, 2011.



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		POWER SYSTEM SECURITY AND STATE ESTIMATION	L	T	P	C
Semester	I		3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> Understand the basic concepts of network matrices, power flow methods, state estimation, and applications of power system state estimation and structure of deregulated power system. Analyze about admittance/impedance matrices, factors influencing power system security, network problems and power wheeling transactions. Implement the methods for determining the bus matrices, optimal ordering, DC power flow, AC power flow, estimating a value and Available Transfer Capability (ATC). Develop the algorithm for orthogonal matrix, method to identify network problems and congestion management methods and electricity sector structure. 						
Course Outcomes (CO): Student will be able to						
<p>CO 1: Understand the concepts of network matrices, power flow methods, contingency analysis, state estimation, and need and conditions for deregulation.</p> <p>CO 2: Analyze the bus admittance/impedance matrices methods, power system security, sensitivity factors, state estimation and electricity structure model.</p> <p>CO 3: Apply the methods for evaluating the bus matrices, sparsity, DC power flow, AC power flow, estimating a value and Available Transfer Capability (ATC).</p> <p>CO 4: Develop the methods for state estimation, method to identify network problems and methods for congestion management.</p>						
UNIT - I	Power System Network Matrices	Lecture Hrs: 10				
Formation of bus admittance matrices by direct inspection method and singular transformation method – Algorithm for formation of Bus impedance matrix: addition of a branch and addition of a link, removal element in Bus impedance matrix– Sparsity programming and Optimal Ordering – Numerical problems – Π -representation of off-nominal tap transformers.						
UNIT - II	Power System Security-I	Lecture Hrs:9				
Review of power flow methods (qualitative treatment only)– DC power flow method-simple problems – Introduction to power system security – Factors influencing power system security.						
UNIT - III	Power System Security-II	Lecture Hrs: 10				
Introduction to contingency analysis – Contingency analysis: Detection of Network problems, linear sensitivity factors –AC power flow methods– Contingency selection– Simple problems.						
UNIT - IV	State Estimation in Power System	Lecture Hrs: 10				
Power system state estimation – SCADA –EMS center, Methods of state estimation – Method of least squares, Orthogonal matrix–Properties– Givens rotation–Orthogonal decomposition–Bad data detection, Pseudo measurements and applications of power system state estimation – Simple problems.						
UNIT - V	Security in Deregulated Environment	Lecture Hrs:9				
Need and conditions for deregulation–Electricity sector structure model – Power wheeling transactions –Congestion management methods– Available Transfer Capability (ATC) – System security in deregulation.						
Textbooks:						
<ol style="list-style-type: none"> Allen J. Wood and Wollenberg B.F., Power Generation Operation and control, John Wiley & Sons, 3rd edition, 2013. P. Venkatesh, B.V. Manikandan, S. Charles Raja and A.Srinivasan, Electrical power systems analysis, security, and deregulation, PHI learning private limited, Delhi, 1st edition 2014. 						
Reference Books:						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

1. Nagrath I.J. and Kothari D.P., Modern Power System Analysis, TMH, New Delhi, 3rd Edition, 2004.
2. John J. Grainger and William D. Stevenson, Power System Analysis, Tata McGraw-Hill, 1st edition, 2003.

Online Learning Resources:

1. <https://nptel.ac.in/content/storage2/courses/108106022/LECTURE%205.pdf>
2. <https://nptel.ac.in/content/storage2/courses/108101040/download/Lec-26.pdf>



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		MACHINE LEARNING APPLICATION TO POWER SYSTEMS. (PE-I)	L	T	P	C
Semester	I		3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> Understand the concepts of machine learning algorithms, artificial neural network. Analyze about the reinforcement learning, concepts of genetic algorithm. Apply the methods to evaluate the genetic modeling and load forecasting. Develop the techniques using machine learnings to determine the economic load dispatch. 						
Course Outcomes (CO): Student will be able to						
CO 1: Understand importance of machine learning and the concepts of learning algorithms. CO 2: Analyse about the artificial neural network, training and testing of ANN, concepts of genetic algorithm. CO 3: Apply the algorithms to determine the constrained and unconstrained problem using genetic algorithm. CO 4: Develop the techniques using machine learnings to determine the load forecasting, fault identification.						
UNIT - I	Machine Learning Concepts					
Basic Concepts of Machine learning, History and early works, techniques, comparison and relation to artificial intelligence, optimization and statistics.						
UNIT - II	Machine Learning Algorithms					
Theoretical aspects of ML, different types of Machine Learning algorithms such as Linear regression, Logistic regression, K - Nearest Neighbor, Artificial Neural Networks, Random Forest, and Support Vector Machine, learning approaches: Supervised learning, unsupervised learning, semi supervised learning, reinforcement learning, self-learning and association rules.						
UNIT - III	Concepts of Artificial Neural Network					
Artificial Neural Network, Basic Concept, early NN Architectures, Characteristics, Neural Network architectures, Single layer feed forward Network, Multi-layer feed forward network, recurrent networks, Non-linear activation operators, learning methods like Back propagation, LM etc., training and testing of ANN.						
UNIT - IV	Concepts of Genetic Algorithm					
Genetic Algorithms: Fundamentals, History, working principal, genetic modeling, encoding, fitness function, Genetic operators: reproduction, cross over, mutation, Similarities and differences between GA and traditional methods; Unconstrained and constrained optimization using Genetic Algorithm.						
UNIT - V	Applications of Machine Learning					
Applications of machine learning in power systems operation and control for solving problems of load forecasting, renewable energy forecasting, load flow studies, Economic load dispatch, Unit commitment, power plant monitoring, fault identification and security assessment etc.						
Textbooks:						
1. Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, “The Elements of Statistical Learning”, Springer, 2 nd Edition, 2017. 2. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 1 st Edition, 2006.						
Reference Books:						
1. NP Padhy, “Artificial Intelligence and Intelligent Systems”, Oxford University Press, 1 st Edition, 2005. 2. Goldberg D.E. “Genetic Algorithms in Search Optimization & Machine Learning”, Addition Wesley Co., New York, 1 st Edition, 1989.						
Online Learning Resources:						
1. https://nptel.ac.in/courses/108/104/108104112/ 2. https://nptel.ac.in/courses/108/104/108104049/						



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		MODELLING AND ANALYSIS OF HVDC SYSTEMS (PE-I)	L	T	P	C
Semester	I			3	0	0
Course Objectives: To make the student						
<ul style="list-style-type: none"> To understand the concept, planning of DC power transmission. To analyze HVDC converters, Transient and Dynamic Stability. To apply modelling of power flow analysis. To design digital dynamic simulation of converters and DC systems 						
Course Outcomes (CO): Student will be able to						
CO 1: To identify the electrical requirements for HVDC lines. CO 2: Analyze the different modes of operation for six pulse & twelve pulse converter unit in the context of HVDC system. CO 3: Apply the knowledge of HVDC transmission in Power networks. CO 4: Determine the appropriate HVDC transmission line parameters under different physical conditions.						
UNIT – I	HVDC CONVERTERS AND SYSTEM CONTROL					
Analysis of HVDC Converters: Pulse number – choice of converter configuration – simplified analysis of Graetz circuit – converter bridge characteristics. Converter and HVDC system control: Principles of DC link control – converter control characteristics – system control hierarchy – firing angle control – current and extinction angle control – starting and stopping of DC link power control.						
UNIT – II	MODELING FOR POWER FLOW ANALYSIS OF AC/DC SYSTEMS					
Modelling of HVDC Components: HVDC Converter model - Converter control - Modelling of DC network - Modelling of AC Network - Power flow analysis in AC/DC systems: Modelling of DC links –Multi terminal DC links- Solution of DC load flow –per unit system for DC qualities – Solution of AC/DC power flow.						
UNIT - III	TRANSIENT AND DYNAMIC STABILITY ANALYSIS					
Transient stability Analysis – Converter model – Converter control models – DC network models – solution methodology – Direct methods for stability Evaluation - Dynamic Stability and power modulation - Power modulation for damping low frequency oscillations – Basic principles – practical consideration in the application of power modulation controllers – Gamma or reactive power modulation – power modulation in MTDC system – voltage stability in AC/DC system.						
UNIT – IV	HARMONIC AND TORSIONAL INTERACTIONS					
Harmonic and Torsional Interactions: Harmonic Interactions - Torsion Interactions – Torsional interactions with in HVDC systems – counter measures to torsion interactions with DC systems - Simulation of HVDC systems: System simulation – philosophy & Tools – HVDC system simulation – modeling of HVDC systems Digital dynamic simulation.						
UNIT – V	MODELING OF HVDC SYSTEMS					
Digital dynamic simulation of converters and DC systems: Valve model, Gate pulse generation – generation of control voltage – transformer model – converter model – transient simulation of DC and AC systems.						
Textbooks:						
<ol style="list-style-type: none"> K.R. Padiyar, HVDC Power Transmission Systems – Technology & System Interactions, New Age International Publishers, 3rd Edition, 2017 S Kamakshaiyah and V Kamaraju, HVDC Transmission, Tata Mc Graw Hill, New Delhi, 2nd Edition, 2021. 						
Reference Books:						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

1. E.W. Kimbark, Direct current transmission, Wiley Inter Science – New York, 1st Edition, 1971.
2. J. Arillaga, HVDC Transmission, Peregrinus Ltd., London UK 2nd Edition, 1998.
3. E. Uhlman, Power transmission by direct current, Springer Verlag, Berlin Helberg, 1st Edition, 1985.

Online Learning Resources:

<https://nptel.ac.in/courses/108/106/108106160/>



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code	POWER SYSTEM OPTIMIZATION		L	T	P	C
Semester	I	(PE-I)	3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> Understand the fundamental concepts of Optimization Techniques. Analyze the importance of optimizations in real life scenarios. Apply the concepts of various classical and modern methods for constrained and unconstrained problems in both single and multivariable. Design the algorithms for different optimizations techniques. 						
Course Outcomes (CO): Student will be able to						
CO 1: Understand the concept of optimality criteria for various type of optimization problems. CO 2: Analyze the concept of different optimization techniques in real world applications. CO 3: Solve various constrained and unconstrained problems in single variable as well as multivariable. CO 4: Design the methods of optimization for real life situation.						
UNIT – I	CONVENTIONAL OPTIMIZATION TECHNIQUES & FUNDAMENTALS OF PARTICLE SWARM OPTIMIZATION (PSO) TECHNIQUES		Lecture Hrs: 10			
Concepts & Terms related to Optimization -Quadratic optimization problem - Karush - Kuhn - Tucker (KKT) necessary and sufficient conditions for quadratic programming problem- Interior point method for convex optimization - linear programming-Background of PSO – Original PSO – Variation of PSO – Discrete PSO – PSO for MINLPs – Constriction Factor Approach (CFA) – Hybrid PSO (HPSO) – L best Model – Adaptive PSO(APSO) Evolutionary PSO (EPSO)– Applications.						
UNIT – II	FUNDAMENTALS OF ANT COLONY SEARCH ALGORITHMS		Lecture Hrs: 9			
Introduction – Ant Colony Search Algorithm – Behaviour of Real Ants– Ant Colony Algorithms – The Ant System – The Ant Colony System – The Max-Min Ant System – Major Characteristics of Ant Colony Search Algorithm – Distributed Computation: Avoid Premature Convergence – Positive Feedback: Rapid Discovery of Good Solution – Use of Greedy Search and Constructive Heuristic Information: Find Acceptable Solutions in the Early Stage of the Process.						
UNIT - III	FUNDAMENTALS OF TABU SEARCH		Lecture Hrs: 12			
Introduction–Overview of the Tabu Search Approach – Problem Formulation – Coding and Representation – Neighborhood Structure – Characterization of the Neighborhood–Functions and Strategies in Tabu Search – Recency- Based Tabu Search – Basic Tabu Search Algorithm – Candidate List Strategies – Tabu tenure – Aspiration Criteria – The Use of Long Term Memory in Tabu Search – Frequency-Based Memory – Intensification – Diversification – Other TS Strategies – Path Relinking – Strategic Oscillation–Applications of Tabu Search.						
UNIT – IV	APPLICATION TO POWERSYSTEMS		Lecture Hrs: 9			
Introduction to power system applications – Model identifications – Dynamic load modeling – Short term load forecasting – Distribution system applications – Network reconfiguration for loss reduction – Optimal protection and switching devices placements – Examples.						
UNIT – V	POWER SYSTEM CONTROLS		Lecture Hrs: 9			
Overview – Power system controls: Particle Swarm Technique – Problem formulation of VVC – State variables – Problem formulation – Expansion of PSO for MINLP – Voltage security assessment – VVC using PSO – Treatment of state variables – VVC algorithm using PSO – Numerical Examples – IEEE 14 Bus system.						
Textbooks:						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

1. A Ravindran, K.M. Ragsdell, and G.V. Reklaitis, “Engineering optimization: Methods and applications”, Wiley India Edition.
2. KwangY. Lee and Mohamed A. EI- Sharkawi “Modern Heuristic Optimization Techniques Theory and Applications to Power Systems”, A. John Wiley & Sons. INC. Publication, 1st edition, 2020
3. D. P. Kothari and J. S. Dhillon, “Power System Optimization”, PHI Learning Private Limited, 2ndEdition, 2011.

Reference Books:

1. Jizhong Zhu, “Optimization of power system operation”, IEEE Press, John Wiley & Sons, Inc., Publication, 2nd edition, 2015.
2. Joshua adam Taylor, “Convex optimization of power systems”, Cambridge University Press, 1st edition, 2015.

Online Learning Resources:

<https://nptel.ac.in/courses/112/106/112106064/>



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

Course Code		SOLAR & WIND ENERGY CONVERSION SYSTEM (PE-II)	L	T	P	C
Semester	I		3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> To introduce photo voltaic systems and principle of wind turbines. To deal with various technologies of solar PV cells. To understand details about manufacture, sizing and operating techniques in solar energy conversion systems. Understand the concepts of fixed speed and variable speed, wind energy conversion systems. To have knowledge of design considerations and analyze grid integration issues. 						
Course Outcomes (CO): Student will be able to						
<p>CO 1: Understand the fundamentals of solar cell, Solar PV Modules from solar cells, system types, Standalone PV system configuration, Maximum Power Point tracking (MPPT) and fundamentals the concepts of fixed speed and variable speed, wind energy conversion systems.</p> <p>CO 2: Apply the concept of various technologies of solar PV cells, manufacture, sizing and operating techniques.</p> <p>CO 3: Analyze the concept of Effect of series and shunt resistance on efficiency, Effect of solar radiation on efficiency, Analytical techniques, Hot spots in the module, Algorithms for MPPT.</p> <p>CO 4: Design of PV powered DC fan without battery, Standalone system with DC load using MPPT, PV powered DC pump, standalone system with battery and AC/DC load and control principles of Wind turbine.</p>						
UNIT – I	SOLAR& WIND FUNDAMENTALS					
Need for sustainable energy sources –solar radiation – the sun and earth movement – angle of sunrays on solar collectors – sun tracking – estimating solar radiation–measurement of solar radiation - Types of wind energy conversion devices – definition - solidity, tip speed ratio, power coefficient, wind turbine ratings and specifications-aerodynamics of wind rotors - design of the wind turbine rotor.						
UNIT – II	SOLAR PHOTOVOLTAIC MODULES					
Solar PV Modules from solar cells– model of a solar cell, effect of series and shunt resistance on efficiency, effect of solar radiation on efficiency - series and parallel connection of cells– mismatch in module – mismatch in series connection – hot spots in the module, bypass diode – mismatching in parallel diode – design and structure of PV modules – number of solar cells in a module, wattage of modules, fabrication of PV module–PV module power output.						
UNIT - III	PV SYSTEM DESIGN AND APPLICATIONS					
Introduction to solar PV systems – standalone PV system configuration – design methodology of PV systems – design of PV powered DC fan without battery, standalone system with DC load using MPPT, design of PV powered DC pump, design of standalone system with battery and AC/DC load – wire sizing in PV system – precise sizing of PV systems – Hybrid PV systems –grid connected PV systems.						
UNIT – IV	WIND TURBINE CONTROL SYSTEMS & SITE ANALYSIS					
Wind Turbine-Torque speed characteristics-Pitch angle control –stall control –power electronic control – Yaw control – Control strategy – Wind speed measurements – Wind speed statistics –Site and turbine selection. Constant voltage & constant frequency- single output system –double output system with current converter & voltage source inverter–equivalent circuits–reactive power and harmonics – reactive power compensation–variable voltage, variable frequency–the self-excitation process–circuit model for the self-excited induction generator–analysis of steady state operation–the excitation requirement–effect of a wind generator on the network.						
UNIT – V	WIND GENERATION WITH VARIABLE SPEED TURBINES AND APPLICATIONS					
Classification of schemes–operating area–induction generators–doubly fed induction generator – wound field synchronous generator – the permanent magnet generator – Merits and limitations of wind energy						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

conversion systems – application in hybrid energy systems – diesel generator and photovoltaic systems – wind photovoltaic systems.

Textbooks:

1. “Solar Photovoltaics Fundamentals, Technologies and Applications” by Chetan singh solanki, PHI Publications, 3rd edition, 2015.
2. S.N.Bhadra, D.Kastha, S.Banerjee, “Wind Electrical Systems” Oxford University Press, 1st edition, 2013.
3. Banshi D. Shukla, “Engineering of Wind Energy”, Jain Brothers, 1st edition, 2018.

Reference Books:

1. H.P. Garg, J. Prakash, Solar Energy Fundamentals and applications Tata McGraw-Hill Publishers 1st edition, 2000.
2. S.Rao & B.B. Parulekar, Energy Technology, Khanna publishers, 4th edition, 2005.
3. N.K. Bansal, M. Kleemann, Michael Meliss, Renewable Energy sources & Conversion Technology, Tata Mcgraw Hill Publishers & Co., 1st edition, 1990.

Online Learning Resources:



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		SMARTGRID TECHNOLOGIES (PE-II)	L	T	P	C
Semester	I		3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> To know the importance of smart grid technology functions over the present grid. To get the knowledge about the measurement system and communication technology of Smart grid. To enhance the quality, efficiency and security of power supply. To impart an understanding of economics, policies and technical regulations for DG integration. 						
Course Outcomes (CO): Student will be able to						
CO 1: Understand the importance of smart grid technology functions over the present grid. CO 2: Apply the knowledge about the measurement system and communication technology of smart grid. CO 3: Determine the quality, efficiency and security of power supply. CO 4: Impart an understanding of economics, policies and technical regulations for DG integration.						
UNIT – I	SMART GRIDS				Lecture Hrs: 10	
Smart grid overview- ageing assets and lack of circuit capacity- thermal constraints, operational constraints, security of supply- national initiatives- early smart grid initiatives- active distribution networks- virtual power plant- other initiatives and demonstrations- overview of the technologies required for the smart grid.						
UNIT – II	TRANSMISSION AND DISTRIBUTION MANAGEMENT				Lecture Hrs: 10	
Data Sources- Energy Management System-Wide Area Applications, Visualization Techniques- Data Sources and Associated External Systems- SCADA- Customer Information System- Modeling and Analysis Tools, Distribution System Modeling- Topology Analysis- Load Forecasting- Power Flow Analysis- Fault Calculations- State Estimation- Applications-System Monitoring- Operation-Management- Outage Management System-Overview of energy storage technologies.						
UNIT - III	SMART METERING AND DEMAND SIDE INTEGRATION				Lecture Hrs: 11	
Overview- Smart metering – Evolution of electricity metering- key components of smart metering- smart meters: an overview of the hardware used – signal acquisition- signal conditioning-analogue to digital conversion- computation-input/output and communication. Communication infrastructure and protocols for smart metering - Home area network, Neighborhood Area Network- Data Concentrator-meter data management system- Protocols for communication. Demand Side Integration- Services Provided by DSI-Implementation of DSI- Hardware Support- Flexibility Delivered by consumers from the Demand Side- System Support from DSI.						
UNIT – IV	COMMUNICATION TECHNOLOGIES FOR THE SMART GRID				Lecture Hrs: 10	
Data Communications: Dedicated and Shared Communication Channels, Switching Techniques, Circuit Switching, Message Switching, Packet Switching- Communication Channels, Introduction to TCP/IP - Communication Technologies: IEEE 802 Series- Mobile Communications-Multi-Protocol Label Switching-Power line Communication.						
UNIT – V	INFORMATION SECURITY FOR THE SMART GRID				Lecture Hrs: 10	
Overview- Encryption and Decryption, Symmetric Key Encryption- Public Key Encryption- Authentication- Authentication Based on Shared Secret Key- Authentication Based on Key						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

Distribution Center- Digital Signatures- Secret Key Signature-Public Key Signature- Message Digest-Impact of Stability.

Textbooks:

1. Janaka Ekanayake, Kithsiri Liyanage, et.al., Smart Grid Technology and Applications, Wiley Publications, 1st edition, 2012.
2. James Momoh, Smart Grid: Fundamentals of Design and Analysis, Wiley, IEEE Press, 1st edition, 2012.
3. Bharat Modi, Anuprakash, Yogesh Kumar, Fundamentals of Smart Grid Technology, S.K Kataria& Sons, 1st edition, 2019.

Reference Books:

1. Eric D. Knapp, Raj Samani, Applied Cyber Security and the Smart Grid-Implementing Security Controls into the Modern Power Infrastructure, Syngress Publishers, 1st edition, 2013.
2. Nouredine Hadjsaid, Jean Claude Sabonnadiere, Smart Grids, Wiley Blackwell Publications, 1st edition, 2012.
3. Peter-Fox Penner, Smart Power: Climate Changes, the Smart Grid and the future of electric utilities, Island Press, 1st edition, 2010.

Online Learning Resources:

www.indiasmartgrid.org



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		ELECTRIC VEHICLE ENGINEERING (PE-II)	L	T	P	C
Semester	I		3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> Remember and understand the differences between conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs. Analyze various EV configurations, parameters of EV systems and Electric vehicle dynamics. Analyze the basic construction, operation and characteristics of fuel cells and battery charging techniques in HEV systems. Design and analyze the various control structures for Electric vehicle. 						
Course Outcomes (CO): Student will be able to						
<p>CO 1: To understand and differentiate between Conventional Vehicle and Electric Vehicles, electro mobility and environmental issues of EVs.</p> <p>CO 2: To remember and understand various configurations in parameters of EV system and dynamic aspects of EV.</p> <p>CO 3: To analyze fuel cell technologies in EV and HEV systems.</p> <p>CO 4: To analyze the battery charging and controls required of EVs.</p>						
UNIT – I	Introduction to EV Systems and Energy Sources		Lecture Hrs: 10			
<p>Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs- EV configuration- EV system- Fixed and Variable gearing- Single and multiple motor drive- In-wheel drives- EV parameters: Weight, size, force and energy, performance parameters.</p> <p>Electro mobility and the environment- History of Electric power trains- Carbon emissions from fuels- Green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems.</p>						
UNIT – II	EV Propulsion and Dynamics		Lecture Hrs: 10			
<p>Choice of electric propulsion system- Block diagram- Concept of EV Motors- Single and multi-motor configurations- Fixed and variable geared transmission- In-wheel motor configuration- Classification - Electric motors used in current vehicle applications - Recent EV Motors- Vehicle load factors- Vehicle acceleration.</p>						
UNIT - III	Fuel Cells		Lecture Hrs: 10			
<p>Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle - Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems- Examples.</p>						
UNIT – IV	Battery Charging and Control		Lecture Hrs: 12			
<p>Battery charging: Basic requirements- Charger architecture- Charger functions- Wireless charging- Power factor correction.</p> <p>Control: Introduction- Modeling of electro mechanical system- Feedback controller design approach- PI controller’s designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.</p>						
UNIT – V	Energy Storage Technologies		Lecture Hrs: 10			
<p>Role of Energy Storage Systems- Thermal- Mechanical-Chemical- Electrochemical- Electrical - Efficiency of energy storage systems- Super capacitors-Superconducting Magnetic Energy Storage (SMES)- SOC- SoH -fuel cells - G2V- V2G- Energy storage in Micro-grid and Smart grid- Energy Management with storage systems- Battery SCADA</p>						
Textbooks:						
<ol style="list-style-type: none"> C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001,1st Edition Ali Emadi, “Advanced Electric Drive Vehicles”, CRC Press, 2017,1st Edition 						
Reference Books:						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021, 3rd Edition.
2. Francisco Díaz-González, Andreas Sumper, Oriol Gomis-Bellmunt,” Energy Storage in Power Systems” Wiley Publication, ISBN: 978-1-118-97130-7, Mar 2016,1st Edition
3. A.G.Ter-Gazarian, “Energy Storage for Power Systems”, the Institution of Engineering and Technology (IET) Publication, UK, (ISBN – 978-1-84919-219-4), Second Edition, 2011.
4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, “Modern Elelectric, Hybrid Elelectric and Fuel Cell Vehicles: Fundamentals, Theory and Design”, CRC Press, 2004,1st Edition
5. James Larminie, John Lowry, “Electric Vehicle Technology Explained”, Wiley, 2003,2nd Edition.

Online Learning Resources:

1. <https://nptel.ac.in/courses/108/102/108102121/>
2. <https://nptel.ac.in/syllabus/108103009>



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		MACHINES & POWER SYSTEMS	L	T	P	C
Semester	I	LAB	0	0	4	2
Course Objectives: To make the student						
<ul style="list-style-type: none"> Understand the experiments ensuring the safety of equipment and personnel. Analyze the power system data fault studies. Interpret the experimental results and correlating them with the practical power system. Design the relays for power system protection purpose. 						
Course Outcomes (CO): Student will be able to						
CO 1: Understand the concept of different experiments. CO 2: Analyze the data for and compute the data to obtain results. CO 3: Apply the computational results to solve the original power system problems. CO 4: Develop advanced relays to identify various faults.						
List of Experiments:						
<ol style="list-style-type: none"> Determination of Subtransient Reactance of a Salient Pole Machine Determination of Sequence Impedances of a Cylindrical Rotor Synchronous Machine Fault Analysis <ol style="list-style-type: none"> LG Fault LL Fault LLG Fault LLLG Fault Equivalent Circuit of a Three Winding Transformer Separation of No Load losses of a Three Phase Squirrel Cage Induction Motor Power Angle Characteristics of a Salient Pole Synchronous Machine Characteristics of Static/Numeric Over Current Relay Characteristics of Static Negative Sequence Relay Characteristics of Static/Numeric Over Voltage Relay Characteristics of Static/Numeric Percentage Biased Differential Relay Testing of Buchholz relay Testing of Frequency Relay. Testing of Reverse Power Relay. Testing of Earth fault Relay 						
Web Sources: https://www.vlab.co.in						



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		POWER SYSTEMS SIMULATION	L	T	P	C
Semester	I	LAB	0	0	4	2
Course Objectives: To make the student						
<ul style="list-style-type: none"> • Understand how to write the coding in simulation • Analyze the data related to load flows, economic dispatch problem and transient stability analysis. • Apply the computational results in real life power system problems. • Have the capabilities to develop new software's to optimize the results. 						
Course Outcomes (CO): Student will be able to						
<p>CO 1: Understand the coding in simulation.</p> <p>CO 2: Analyze the power system data for load-flow and stability studies.</p> <p>CO 3: Apply computational methods for large scale power system studies.</p> <p>CO 4: Develop software for power system industry to solve various issues.</p>						
List of Experiments:						
<ol style="list-style-type: none"> 1. Y - Bus Formation 2. Gauss – Seidel Load Flow Analysis 3. Fast Decoupled Load Flow Analysis 4. Fast Decoupled Load Flow Analysis for Distribution Systems 5. Point by Point Method 6. Computation of Available Transfer Capabilities. 7. Contingency analysis. 8. State estimation using Weighted Least Square, linear and non-linear methods. 9. Simulation of power quality problems (Sag/Swell, interruption, transients, harmonics, flickers etc.) 10. Harmonic analysis and Single tuned filter design to mitigate harmonics. 11. Harmonic analysis and Double tuned filter design to mitigate harmonics. 						
Web Sources: https://www.vlab.co.in						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

Course Code		Research Methodology and IPR	L	T	P	C
Semester	I		2	0	0	2
Course Objectives: To make the student						
Course Outcomes (CO): Student will be able to						
<ul style="list-style-type: none"> • Understand research problem formulation. • Analyze research related information • Follow research ethics • Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. • Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. • Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits. 						
UNIT – I			Lecture Hrs: 8			
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations						
UNIT - II			Lecture Hrs: 4			
Effective literature studies approaches, analysis Plagiarism, Research ethics						
UNIT - III			Lecture Hrs: 5			
Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee						
UNIT - IV			Lecture Hrs: 8			
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.						
UNIT - V			Lecture Hrs: 7			
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.						
Textbooks:						
<ol style="list-style-type: none"> 1. Stuart Melville and Wayne Goddard, “Research methodology: An introduction for science & engineering students” 2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction” 3. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide• for beginners” 4. 						
Reference Books:						
1. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

2. Mayall, "Industrial Design", McGraw Hill, 1992.
3. Niebel, "Product Design", McGraw Hill, 1974.
4. Asimov, "Introduction to Design", Prentice Hall, 1962.
5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
6. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

Online Learning Resources:



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code	POWER SYSTEM PLANNING AND CONTROL			L	T	P	C
Semester	II			3	0	0	3
Course Objectives: To make the student							
<ul style="list-style-type: none"> Understand about linear and nonlinear models of multi-machine power systems. Analyze various types of stability properties of power systems. Identify power system models from dynamic data and simulate excitation mechanisms in synchronous machines. Design excitation systems and their state space model equations for further stability applications. 							
Course Outcomes (CO): Student will be able to							
CO 1: Understand the concepts of single and multi-machine systems connected to infinite bus bar. CO 2: Analyze system responses to small disturbances and concept of dynamic stability and power system stabilizers. CO 3: Apply the various stability methods to evaluate the stability of the system. CO 4: Design the state space model equations for excitation systems and methods for finding voltage and angle instability.							
UNIT - I	Economic operation			Lecture Hrs: 10			
Load forecasting - Unit commitment – Economic dispatch problem of thermal units – Gradient method - Newton’s method – Base point and participation factor method.							
UNIT - II	Unit Commitment			Lecture Hrs: 8			
Optimal Unit Commitment, Constraints in unit commitment, spinning reserve, Thermal Unit Constraints, Other constraints, Hydro constraints, Must Run, Fuel constraints.Solution methods of Unit Commitment- Priority-List methods, Dynamic Programming solution. Backward DP Approach, Forward DP Approach, RestrictedSearchRanges, Strategies- Reliability considerations							
UNIT - III	Hydrothermal co-ordination			Lecture Hrs: 12			
Short-term hydrothermal scheduling problem - Gradient approach – Hydro units in series - pumped storage hydro plants-hydro - scheduling using dynamic programming and linear programming.							
UNIT - IV	Generation with limited energy supply			Lecture Hrs:12			
Introduction, Take-or-Pay Fuel Supply Contract, Composite Generation production Cost Function, Solution by Gradient Search Techniques, Hard limits and Slack Variables, Economic interchange between interconnected utilities – Inter utility energy evaluation – Power pools – Transmission effects and Issues: Limitations – Wheeling.							
UNIT - V	Production Cost Models			Lecture Hrs:10			
Introduction- uses and types- production costing using load duration curves- outages considered. Probabilistic Production Cost Programs-Probabilistic Production Cost Computations- Simulating Economic Scheduling with the Unserved Load Method- The Expected Cost Method-Practical Problems.							
Textbooks:							
1. <u>Vijay Vittal</u> , <u>James D. McCalley</u> , <u>Paul M. Anderson</u> “Power System Control and Stability”, Jhon Willey and Sons, 3 rd edition, 2019.							



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

2. **Prabha Kundur**, “Power System Control and Stability”, McGraw Hill Education India, 1st edition, 5th reprint, 2008.

Reference Books:

1. Dr Jan Machowski, Dr Janusz W. Bialek, Dr Jim Bumby · “Power System Dynamics: Stability and Control”, Jhon Willey and Sons, 2nd Edition, 2011.
2. M.A. Pai, Power System Stability Analysis by the direct method of Lyapunov, North Holland Publishing Company, New York, 1st edition, 1981.

Online Learning Resources:



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		FACTS CONTROLLERS	L	T	P	C
Semester	II		3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> To understand the fundamentals of FACTS Controllers, Importance of controllable parameters and types of FACTS controllers & their benefits. To explain control of STATCOM and SVC and their comparison and the regulation of STATCOM. To remember the objectives of Shunt and Series compensation. To analyze the functioning and control of GCSC, TSSC and TCSC. 						
Course Outcomes (CO): Student will be able to						
CO 1: Understand various control techniques for the purpose of identifying the scope and for selection of specific FACTS controllers. CO 2: Remember different types of controllable VAR generation and variable impedance techniques. CO 3: Design simple converters using FACTS controllers. CO 4: Understand the operation of Unified Power Controller and Hybrid Arrangements.						
UNIT - I	FACTS CONCEPTS, VSI AND CSI		Lecture Hrs: 10			
Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters basic types of FACTS controllers, benefits from FACTS controllers. Single phase three phase full wave bridge converters transformer connections for 12pulse 24 and 48 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage source converters.						
UNIT - II	SHUNT COMPENSATION		Lecture Hrs: 8			
Objectives of shunt compensation - Methods of controllable var generation - Variable impedance type static var generators - switching converter type var generators - hybrid var generators – Comparison of SVC and STATCOM.						
UNIT - III	SERIES COMPENSATION		Lecture Hrs: 12			
Objectives of series compensation–GTO Thyristor Controlled Series Capacitor (GCSC)-Thyristor Switched Series Capacitor (TSSC) - Thyristor Controlled Series Capacitor (TCSC) - Control schemes for TCSC, TSSC and TCSC.						
UNIT - IV	UNIFIED POWER FLOW CONTROLLER (UPFC)		Lecture Hrs:12			
Introduction - The Unified Power Flow Controller - Basic Operating Principles - Conventional Transmission Control Capabilities - Independent Real and Reactive Power Flow Control - Control Structure – Basic Control System for P and Q Control-Hybrid Arrangements: UPFC With a Phase Shifting Transformer.						
UNIT - V	INTERLINE POWER FLOW CONTROLLER (IPFC)		Lecture Hrs:10			
Introduction, basic operating principle and characteristics of IPFC, control structure, practical and application considerations, generalized and multifunctional FACTS controllers						
Textbooks:						
<ol style="list-style-type: none"> Understanding FACTS–Concepts and technology of Flexible AC Transmission systems, Narain G. Hingorani, Laszlo Gyugyi, IEEE Press, WILEY, 1st Edition, 2000, Reprint 2015. FACTS Controllers in Power Transmission and Distribution, Padiyar K.R., New Age 						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

International Publishers, 1st Edition, 2007.

Reference Books:

1. Flexible AC Transmission Systems: Modelling and Control, Xiao–Ping Zhang, Christian Rehtanz, Bikash Pal, Springer, 2012, First Indian Reprint,2015.
2. FACTS–Modelling and Simulationin Power Networks, Enrigue Acha, Claudio R. Fuerte – Esquivel, Huge Ambriz –perez, Cesar Angeles –Camacho, WILEY, 1st edition, 2004.

Online Learning Resources:



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		POWER SYSTEM WIDE AREA MONITORING AND CONTROL (PE-III)	L	T	P	C
Semester	II			3	0	0
Course Objectives: To make the student						
<p>To know the necessity of real-time computer control of power systems and wide area measurement systems.</p> <p>To gain knowledge of different automation systems.</p> <p>To understand the fundamentals of SCADA and its importance in real-time power systems.</p> <p>To learn about Substation Automation, New Digital Substation, the traditional approach, and the IED-based approach of Integrated Protective Functions.</p> <p>To study voltage stability, prevention of voltage collapse, and dynamic stability analysis.</p>						
Course Outcomes (CO): Student will be able to						
<p>CO 1: Understand the necessity of real-time computer control of power systems and wide area measurement systems.</p> <p>CO 2: Gain knowledge of different automation systems.</p> <p>CO 3: Comprehend the fundamentals of SCADA and its importance in real-time power systems.</p> <p>CO 4: Learn about Substation Automation, New Digital Substation, the traditional approach, and the IED-based approach of Integrated Protective Functions.</p> <p>CO 5: Study voltage stability, prevention of voltage collapse, and dynamic stability analysis.</p>						
UNIT - I	COMPUTER CONTROL OF POWER SYSTEMS		Lecture Hrs: 10			
Need for computer control of power systems, Operating states of a power system, Supervisory Control and Data Acquisition system, Energy control centers. Wide Area Measurement system(WAMS): Architecture, Components of WAMS, Applications: Voltage Stability Assessment, Frequency stability Assessment, Power Oscillation Assessment, Communication needs of WAMS, Wide Area Monitoring Protection & Control, and Remedial Action Scheme.						
UNIT - II	POWER SYSTEM AUTOMATION		Lecture Hrs: 8			
Introduction, Evolution of Automation Systems, History of Automation Systems, Supervisory Control and Data Acquisition (SCADA) Systems, Components of SCADA Systems, SCADA Applications, SCADA in Power Systems, SCADA Basic Functions, SCADA Application Functions, Advantages of SCADA in Power Systems, Deferred Capital Expenditure, Optimized Operation and Maintenance Costs, Equipment Condition Monitoring (ECM), Sequence of Events (SOE) Recording, Power Quality Improvement, Data Warehousing for Power Utilities, Power System Field, Transmission and Distribution Systems, Customer Premises, Types of Data and Signals in Power Systems Flow of Data from the Field to the SCADA Control Center						
UNIT - III	SCADA FUNDAMENTALS		Lecture Hrs: 12			
Introduction, Open System: Need and Advantages, Building Blocks of SCADA Systems, Remote Terminal Unit (RTU), Evolution of RTUs, Components of RTU, Communication Subsystem, Logic Subsystem Termination Subsystem, Testing and Human-Machine Interface (HMI) Subsystem, Power Supplies, Advanced RTU Functionalities, Intelligent Electronic Devices (IEDs), Evolution of IEDs, IED Functional Block Diagram, Hardware and Software Architecture of the IED, IED Communication Subsystem, IED Advanced Functionalities, Tools for Settings, Commissioning, and Testing, Programmable LCD Display, Typical IEDs, Data Concentrators and Merging Units, RTUs, IEDs, and Data Concentrator, Merging Units and IEDs.						
UNIT - IV	SUBSTATION AUTOMATION		Lecture Hrs: 12			
Substation Automation: Technical Issues, System Responsibilities, System Architecture, Substation Host Processor, Substation LAN, User Interface, Communications Interfaces, Protocol Considerations. The New Digital Substation, Process Level, Protection and Control Level, Station Bus and Station Level,						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

Substation Automation Architectures, Legacy Substation Automation System, Digital Substation Automation Design, New versus Existing Substations. Drivers of Transition, Migration Paths and the Steps Involved, Value of Standards in SubstationAutomation,SubstationAutomation(SA)ApplicationFunctions,IntegratedProtectionFunctions: Traditional Approach and IED-Based Approach. Automation Functions, Enterprise-Level Application Functions.

UNIT - V | VOLTAGE STABILITY | Lecture Hrs:10

Basic concepts, Voltage collapse—general characterization,classification,Voltage stability analysis—modeling,dynamic analysis,static analysis,shortest distance to instability,continuation power flow analysis, prevention of voltage collapse – design measures, operating measures.

Textbooks:

- 1. Allen J. Wood and Bruce Woolenber, Power System Generation, Operation and Control, John Wiley and Sons, 3rd edition, 2013.
2. Prabha Kundur, Power System Control and Stability, McGraw Hill Education India, 1st edition, 5th reprint, 2008.
3. Mini S. Thomas and John Douglas McDonald, Power System SCADA and Smart Grids, CRC Press, 1st edition, 2015.

Reference Books:

- 1. E. Handschin, Real-time Control of Electrical Power Systems, Elsevier Publications & Co, 1st edition, 1988.
2. Special Issue on Computer Control of Power Systems, IEEE Proceedings, July 197



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		MODERN CONTROL THEORY (PE-III)	L	T	P	C
Semester	II		3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> Remember and understand the concept of state space representation, Solution of state equation, STM, linearization of nonlinear systems, controllability and observability concepts, principles of duality, concepts of optimal and Lyapunov stability. Apply the above concepts to analyze controllability, Observability and pole placement by state feedback Analyze the concept of regulator, stability and sensitivity using various methods and disturbance rejection Design Full order observer and reduced order observer. 						
Course Outcomes (CO): Student will be able to						
CO 1: Understand the state space representation, controllability and observability concepts, principles of duality, concepts of optimal and Lyapunov stability. CO 2: Apply the state equations, pole placement by state feedback. CO 3: Analyze controllability & observability of state models. CO 4: Design full order observer and reduced order observer.						
UNIT - I	STATE VARIABLE DISCRPTION		Lecture Hrs: 10			
Introductory matrix algebra and linear Vector Space, State space representation of systems- Linearization of a non-linear System- Solution of state equations- Evaluation of State Transition Matrix (STM).						
UNIT - II	TRANSFORMATION, POLE PLACEMENT AND CONTROLLABILITY					
Similarity transformation and invariance of system properties due to similarity transformations. Minimal realization of SISO, SIMO and MISO transfer functions. Discretization of a continuous time state space model- Conversion of state space model to transfer function model using Fadeeva algorithm- Fundamental theorem of feedback control - Controllability and Controllable canonical form - Pole assignment by state feedback using Ackermann's formula– Eigen structure assignment problem.						
UNIT - III	OPTIMAL CONTROL		Lecture Hrs: 12			
Linear Quadratic Regulator (LQR) problem and solution of algebraic Riccati equation using Eigen value and Eigen vector methods- iterative method- Controller design using output feedback.						
UNIT - IV	OBSERVERS		Lecture Hrs:12			
Observability and observable canonical form-Design of full order observer using Ackermann's formula -Bass Gura algorithm- Duality between controllability and observability- Full order Observer based controller design- Reduced order observer design.						
UNIT - V	STABILITY ANALYSIS AND SENSITIVITY		Lecture Hrs:10			
Internal stability of a system- Stability in the sense of Lyapunov- Asymptotic stability of linear time invariant continuous and discrete time systems- Solution of Lyapunov type equation- Model decomposition and decoupling by state feedback- Disturbance rejection- sensitivity and complementary sensitivity functions.						
Textbooks:						
1. K. Ogata, "Modern Control Engineering", Prentice Hall, India, 5 th edition, 2010. 2. T. Kailath, "Linear Systems", Prentice Hall, 2016. 3. N.K. Sinha, "Control Systems", New Age International, 4 th edition, 2013.						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

Reference Books:

1. Panos J Antsaklis, and Anthony N. Michel, “LinearSystems”, New-age international (P) LTD.Publishers, 2009.
2. John JDAzzoand C. H. Houpis, “Linear Control System Analysis and Design conventional and Modern”, Mc Graw- Hill Book Company, 3rd edition, 1988.
3. B.N.Dutta, “Numerical Methods for linear Control Systems”, Elsevier Publication, 2007.
4. C.T. Chen “Linear System Theory and Design-PHI, India,1984.
5. Richard C. Dorf and Robert H. Bishop, “Modern Control Systems”, 11th Edition, Pearson Edu., India, 2009



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		POWERQUALITY	L	T	P	C
Semester	II	(PE- IV)	3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> To understand power quality definition, power quality standards. To remember measuring & solving power quality problems. To apply the various types of linear and nonlinear loads. To analyse harmonic methodology, mitigation techniques and case study. 						
Course Outcomes (CO): Student will be able to						
CO 1: Understand the fundamentals & terminology of power quality. CO 2: Apply the concept of power frequency disturbances, types of transients & transient waveforms. CO 3: Analyze the harmonic methodology & Electromagnetic Interference concepts. CO 4: Remember the necessity of grounding and methods of grounding. CO 5: Understand different techniques of measuring & solving power quality problems.						
UNIT - I	INTRODUCTION TO POWERQUALITY		Lecture Hrs: 10			
Definition of Power Quality - Power Quality Progression - Power Quality Terminology - Power Quality Issues– Responsibilities of Power Suppliers and Users-Power Quality Standards.						
UNIT - II	POWER FREQUENCY DISTURBANCE&TRANSIENTS		Lecture Hrs: 8			
Introduction to Power Frequency Disturbance - Common Power Frequency Disturbances – Characteristics of Low Frequency Disturbances - Voltage Tolerance Criteria- ITIC Graph - Introduction to Transients -Transient System Model - Examples of Transient Models and Their Response - Power System Transient Modeling-Types and Causes of Transients -Examples of Transient Waveforms.						
UNIT - III	HARMONICS & ELECTROMAGNETIC INTERFERENCE (EMI)		Lecture Hrs: 12			
Definition of Harmonics - Harmonic Number (h) - Odd and Even Order Harmonics - Harmonic Phase Rotation and Phase Angle - Voltage and Current Harmonics - Individual and Total Harmonic Distortion -Harmonic Signatures - Effect of Harmonics On Power System Devices - Guidelines For Harmonic Voltage and Current Limitation - Harmonic Current Mitigation - Introduction to EMI - Frequency Classification –Electrical Fields-Magnetic Fields-EMI Terminology-Power Frequency Fields-High Frequency Interference-EMI Susceptibility-EMI Mitigation-Cable Shielding-Health Concerns of EMI.						
UNIT - IV	GROUNDINGANDBONDING		Lecture Hrs:12			
Introduction to Grounding and Bonding-Shock and Fire Hazards-NEC Grounding Requirements-Essentials of a Grounded System-Ground Electrodes-Earth Resistance Tests-Earth Ground Grid Systems-Power Ground System-Signal Reference Ground(SRG)-SRG Methods-Single and Multipoint Grounding –Ground Loops –Electro chemical Reaction -Examples of Grounding Anomalies.						
UNIT - V	MEASURING AND SOLVING POWER QUALITY PROBLEMS		Lecture Hrs:10			
Introduction to Power Quality Measurements-Power Quality Measurement Devices-Power Quality Measurements Test Locations-Test Duration-Instrument Setup- Instrument Guidelines						
Textbooks:						
1. Power quality by C. Sankaran, CRC Press, 1 st Edition, 2001.						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

- | |
|--|
| 2. Electrical Power Systems Quality, Roger C. Dugan, Mark F. Mc Granaghan, Surya Santoso, H. Wayne Beaty, 2 nd Edition, TMH Education Pvt. Ltd, 1996. |
|--|

Reference Books:

- | |
|--|
| 1. Understanding Power quality problems by Math H. J.Bollen IEEE Press, 1 st edition, 2000. |
| 2. Power quality enhancement using custom power devices by Arindam, Ghosh, Gerard Ledwich, Kluwer, Academic publishers, 1 st edition, 2002. |



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		DISTRIBUTED GENERATION & MICROGRID CONTROL (PE– IV)	L	T	P	C
Semester	II		3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> • Able to understand the concept of distributed generation, distribution network, and the concept of Microgrid, including its configuration, advantages, and limitations. • Able to understand the basic concepts in combined heat and power, wind energy conversion systems, solar photovoltaic systems, and other renewable energy sources. • Able to analyze the impact of Microgrid and Active Distribution Network Management System on various factors. • Able to understand the effect of SCADA and comprehend the concept of power quality disturbances, improvement technologies, and issues of premium power in DC integration. 						
Course Outcomes (CO): Student will be able to						
<ul style="list-style-type: none"> • CO 1: Understand the concept of distributed generation, distribution network, and the concept of Microgrid, including its configuration, advantages, and limitations. • CO 2: Understand the basic concepts in combined heat and power, wind energy conversion systems, solar photovoltaic systems, and other renewable energy sources. • CO 3: Analyze the impact of Microgrid and Active Distribution Network Management System on various factors. • CO 4: Understand the effect of SCADA and the concept of power quality disturbances, improvement technologies, and issues of premium power in DC integration. 						
UNIT - I	INTRODUCTION TO DISTRIBUTED GENERATION AND MICROGRID CONCEPT	Lecture Hrs: 10				
Introduction to distributed generation - Active distribution network - Concept of Microgrid - Microgrid configuration - Interconnection of Microgrids - Technical and economical advantages of Microgrid - Challenges and limitations of Microgrid development - Management and operational issues of a Microgrid - Dynamic interactions of Microgrid with main grid – low voltage DC grid.						
UNIT - II	DISTRIBUTED ENERGY RESOURCES	Lecture Hrs: 8				
Introduction - Combined heat and power (CHP) systems: Micro-CHP systems - Wind energy conversion systems (WECS): Wind turbine operating systems - Solar photovoltaic (PV) systems: Classification of PV cell - Small-scale hydroelectric power generation - Other renewable energy sources - Storage devices.						
UNIT - III	MICRO GRID AND ACTIVE DISTRIBUTION NETWORK MANAGEMENT SYSTEM	Lecture Hrs: 12				
Introduction - Impact on heat utilization - Impact on process optimization - Impact on market - Impact on environment - Impact on distribution system - Impact on communication standards and protocols - Network management needs of Microgrid – Micro source controller - Central controller.						
UNIT - IV	SCADA AND ACTIVE DISTRIBUTION NETWORKS	Lecture Hrs: 12				
Introduction - Existing DNO SCADA systems - Control of DNO SCADA systems - SCADA in Microgrids - Human-machine interface (HMI) - Hardware components - Communication trends in SCADA - Distributed control system (DCS) - Sub-station communication standardization - SCADA communication and control architectures - Communication devices.						
UNIT - V	IMPACT OF DEGENERATION ON POWER QUALITY AND RELIABILITY	Lecture Hrs: 10				



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Introduction - Power quality disturbances - Power quality sensitive customers - Power quality improvement technologies - Impact of DG integration - Issues of premium power in DG integration.

Textbooks:

1. S. Chowdhury, S. P. Chowdhury, and P. Crossley, Microgrids and Active Distribution Networks, The Institution of Engineering and Technology, 2009.
2. Rajeev Kumar Chuahan, Kalpana Chuahan, Distributed Energy Resources in Microgrids: Integration, Challenges and Optimization, Academic Press, 1st Edition, 2019.

Reference Books:

1. Magdi S. Mahmoud, “MICROGRID Advanced Control Methods and Renewable Energy System Integration”, Joc Hayton, 1st Edition, 2016.



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code			L	T	P	C
Semester	II	RENEWABLE ENERGY SYSTEMS LAB	0	0	4	2

Course Objectives: To make the student

- Understand how to write the coding in MATLAB/Mipower.
- Apply the SVC,STATCOM for voltage profile improvements & UPFC in power system networks.
- Analyze the data related to load flows incorporating SVC & STATCOM.
- Analyze operation of TCSC, STATCOM & SSSC for a transmission line fed by an AC supply.

Course Outcomes (CO): Student will be able to

- CO 1:** To observe the I-V and P-V curves and Series and Parallel connection of Solar systems.
- CO 2:** To study the sun tracking and MPPT Charge Controllers of Solar systems.
- CO 3:** To analyze Power, Voltage & Frequency Measurement of Wind Generator.
- CO 4:** To Understand the Effect of temperature variation and Irradiation on Photovoltaic Array.

List of Experiments:

1. Draw the I-V and P-V curves of Solar Panel using PV Panel
2. Study of Series and Parallel connection of Solar Panels
3. Study of Sun tracking system
4. Maximum Power Point Tracking Charge Controllers
5. Inverter control for Solar PV based systems
6. Power, Voltage & Frequency Measurement of output of Wind Generator
7. Impact of load and wind speed on power output and its quality
8. Performance of frequency drop characteristics of induction generator at different loading condition
9. Charging and Discharging characteristics of Battery

Simulation Experiments

1. Modelling of PV Cell
2. Effect of temperature variation on Photovoltaic Array
3. Effect of Irradiation on a Photovoltaic Array
4. Design of solar PV boost converter using P&O MPPT technique

Web Sources: <https://www.vlab.co.in>

Note: Conduct any 7 experiments from 1-9 list and minimum 3 experiments from 1-4 of Simulation experiments



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code			L	T	P	C
Semester	II	FACTS DEVICES & SIMULATION LAB	0	0	4	2
Course Objectives: To make the student						
<ul style="list-style-type: none"> • Understand how to write the coding in MATLAB/Mipower. • Apply the SVC,STATCOM for voltage profile improvements & UPFC in power system networks. • Analyze the data related to load flows incorporating SVC & STATCOM. • Analyze operation of TCSC, STATCOM & SSSC for a transmission line fed by an AC supply. 						
Course Outcomes (CO): Student will be able to						
<p>CO 1: Understand Load balancing using compensators. CO 2: Apply load balancing using Compensators. CO 3: Analyse load flow incorporating SVC & STATCOM. CO 4: Develop a Simulation model for STATCOM & UPFC.</p>						
List of Experiments:						
<ol style="list-style-type: none"> 1. Voltage regulation using shunt and series compensation 2. Load balancing in power system network using compensators 3. Simulation of TCSC 4. Voltage profile improvement using SVC 5. Voltage profile improvement using STATCOM 6. Transient Stability enhancement using STATCOM. 7. Simulation of UPFC with mathematical models 8. Load flow incorporating SVC 9. Load flow incorporating STATCOM 10. Simulation of DVR 11. Transmission Line Characteristics (P vs δ, Q vs δ, P vs Distance, Q vs Distance and V vs Distance) with and without Compensation 12. Sizing- simulation and operation of TCR and FC-TCR for a transmission line fed by an ac supply and feeding <ol style="list-style-type: none"> (a) Resistive/inductive/capacitive load one at a time (b) A load which can have leading as well as lagging behaviour 13. Sizing- simulation and operation of TCSC for a transmission line fed by an ac supply and feeding <ol style="list-style-type: none"> (a) Resistive/inductive/capacitive load one at a time (b) A load which can have leading as well as lagging behaviour 14. Sizing- simulation and operation of STATCOM for a transmission line fed by an ac supply and feeding <ol style="list-style-type: none"> (a) Resistive/inductive/capacitive load one at a time (b) A load which can have leading as well as lagging behavior 15. Sizing- simulation and operation of SSSC for a transmission line fed by an AC supply and feeding <ol style="list-style-type: none"> (a) Resistive/inductive/capacitive load one at a time (b) A load which can have leading as well as lagging behaviour 						
Web Sources: https://www.vlab.co.in						



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		RESTRUCTURED POWER SYSTEMS (PE-V)	L	T	P	C
Semester	III		3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> • Understand basic concepts of the restructuring of the power industry and market models. • Analyze the fundamental concepts of congestion management, transfer capability issues, and ancillary service management. • Apply the transmission cost allocation methods to evaluate the cost. • Develop operational planning activities in different competitive environments. 						
Course Outcomes (CO): Student will be able to						
<ul style="list-style-type: none"> • CO 1: Understand the differences between the conventional power system operation and the restructured one, and the basic concepts of market power, electricity pricing, and competitive environment. • CO 2: Analyze the concepts of Independent System Operator (ISO) and Open Access Same-Time Information System (OASIS). • CO 3: Apply the methods to find Available Transfer Capability (ATC) and to allocate the transmission cost. • CO 4: Develop power markets and market architectural aspects, and perform short-time price forecasting 						
UNIT – I	KEY ISSUES IN ELECTRIC UTILITIES					
Introduction – Restructuring models – Independent System Operator (ISO) – Power Exchange – Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of interzonal/intrazonal congestion.			<p align="center">KEY ISSUES IN ELECTRIC UTILITIES</p> <p>Introduction – Restructuring models – Independent System Operator (ISO) – Power Exchange – Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of interzonal/intrazonal congestion.</p>			



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

UNIT – II: OPEN ACCESS SAME-TIME INFORMATION SYSTEM (OASIS) & MARKET POWER

Structure of OASIS – Posting of Information – Transfer capability on OASIS – Market Power: Introduction – Different types of market power – Mitigation of market power – Examples.

UNIT – III: AVAILABLE TRANSFER CAPABILITY (ATC) & ELECTRICITY PRICING

Transfer capability issues – ATC – TTC – TRM – CBM calculations – Calculation of ATC based on power flow – Electricity Pricing: Introduction – Electricity price volatility – Electricity price indexes – Challenges to electricity pricing – Construction of forward price curves – Short-time price forecasting.

UNIT – IV: POWER SYSTEM OPERATION IN COMPETITIVE ENVIRONMENT



	<p>Introduction – Operational planning activities of ISO – The ISO in pool markets – The ISO in bilateral markets – Operational planning activities of a GENCO.</p> <p>UNIT – V: TRANSMISSION COST ALLOCATION METHODS & ANCILLARY SERVICES MANAGEMENT</p> <p>Transmission cost allocation methods: Postage Stamp Rate Method – Contract Path Method – MW-Mile Method – Unused Transmission Capacity Method – MVA-Mile Method – Comparison of cost allocation methods – Ancillary services management: Introduction – Reactive power as an ancillary service, a review – Synchronous generators as ancillary service providers.</p> <p>Textbooks:</p> <ol style="list-style-type: none">1. Kankar Bhattacharya, Math H. J. Boller, and Jaap E. Daalder,
--	--



			<p><i>Operation of Restructured Power System,</i> Kluwer Academic Publishers, 1st Edition, 2001.</p> <p>2. Mohammad Shahidehpour and Muwaffaq Alomoush, <i>Restructured Electrical Power Systems,</i> Marcel Dekker, Inc., 1st Edition, 2001.</p> <p>Reference Books:</p> <p>1. Loi Lei Lai, <i>Power System Restructuring and Deregulation,</i> John Wiley & Sons Ltd., England, 2001.</p> <p>Online Learning Resources:</p> <p>1. NPTEL Course</p>
<p>UNIT - II</p>	<p>OPEN ACCESS SAME-TIME INFORMATION SYSTEM (OASIS) & MARKET POWER</p>		
<p>Structure of OASIS – Posting of Information – Transfer capability on OASIS – Market Power: Introduction – Different types of market power – Mitigation of market power – Examples.</p>			



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

UNIT - III	AVAILABLE TRANSFER CAPABILITY (ATC) & ELECTRICITY PRICING	
Transfer capability issues – ATC – TTC – TRM – CBM calculations – Calculation of ATC based on power flow – Electricity Pricing: Introduction – Electricity price volatility – Electricity price indexes – Challenges to electricity pricing – Construction of forward price curves – Short-time price forecasting		
UNIT - IV	POWER SYSTEM OPERATION IN COMPETITIVE ENVIRONMENT	Lecture Hrs: 9
Introduction – Operational planning activities of ISO – The ISO in pool markets – The ISO in bilateral markets – Operational planning activities of a GENCO.		
UNIT - V	TRANSMISSION COST ALLOCATION METHODS & ANCILLARY SERVICES MANAGEMENT	
Transmission cost allocation methods: Postage Stamp Rate Method – Contract Path Method – MW-Mile Method – Unused Transmission Capacity Method – MVA-Mile Method – Comparison of cost allocation methods – Ancillary services management: Introduction – Reactive power as an ancillary service, a review – Synchronous generators as ancillary service providers		
Textbooks:		
<ol style="list-style-type: none"> 1. Kankar Bhattacharya, Math H. J. Boller, and Jaap E. Daalder, <i>Operation of Restructured Power System</i>, Kluwer Academic Publishers, 1st Edition, 2001. 2. Mohammad Shahidehpour and Muwaffaq Alomoush, <i>Restructured Electrical Power Systems</i>, Marcel Dekker, Inc., 1st Edition, 2001. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Loi Lei Lai, <i>Power System Restructuring and Deregulation</i>, John Wiley & Sons Ltd., England, 2001. 		
Online Learning Resources:		
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/108/101/108101005/ 		



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		RISK ASSESSMENT OF POWER SYSTEMS	L	T	P	C
Semester	I		3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> Understand the basic concepts of risk assessment and risk evaluation. Analyze the risk evaluation methods and risk evaluation techniques. Apply the risk evaluation techniques and correlation methods to identify the risk in power systems. Develop the risk evaluation models for renewable energy systems. 						
Course Outcomes (CO): Student will be able to						
CO 1: Understand the risk evaluation concepts, independent and dependent outages, Distribution of failure data. CO 2: Analyze the concepts of outages, correlation measures, models, contingency analysis. CO 3: Apply the methods to evaluate the frequency, correlation and load curtailments. CO 4: Develop the sampling methods and risk evaluation methods for renewable energy systems.						
UNIT – I	Risk Assessment and Outage Models		Lecture Hrs: 8			
Basic concepts of power system risk assessment: System risk evaluation, Data in risk evaluation, Unit interruption cost - Models of independent outages: Repairable forced failure, Aging failure, Non-repairable chance failure, Planned outage, Semi forced outage, Partial failure mode, Multiple failure mode - Models of dependent outages: Common-Cause outage, Component-Group outage, Station-Originated outage, Cascading outage, Environment-Dependent failure						
UNIT - II	Parameter Estimation in Outage Models		Lecture Hrs: 12			
Point Estimation on Mean and Variance of Failure Data - Interval Estimation on Mean and Variance of Failure Data - Estimating Failure Frequency of Individual Components - Estimating Probability from a Binomial Distribution - Experimental Distribution of Failure Data and Its Test - Estimating Parameters in Aging Failure Models						
UNIT - III	Elements of Risk Evaluation Methods		Lecture Hrs: 10			
Methods for Simple Systems: Probability Convolution, Series and Parallel Networks, Minimum Cutsets, Markov Equations, Frequency-Duration Approaches - Methods for Complex Systems: State Enumeration, Nonsequential Monte Carlo Simulation, Sequential Monte Carlo Simulation - Correlation Models in Risk Evaluation: Correlation Measures, Correlation Matrix Methods						
UNIT - IV	Risk Evaluation Techniques		Lecture Hrs: 14			
Techniques Used in Generation-Demand Systems: Convolution Technique, State Sampling Method, State Duration Sampling Method - Techniques Used in Radial Distribution Systems: Analytical Technique, State Duration Sampling Method - Techniques Used in Substation Configurations: Failure Modes and Modeling, Connectivity Identification, Stratified State Enumeration Method, State Duration Sampling Method - Techniques Used in Composite Generation and Transmission Systems: Basic Procedure, Component Failure Models, Load Curve Models, Contingency Analysis, Optimization Models for Load Curtailments, State Enumeration Method, State Sampling Method						
UNIT - V	Application of Risk Evaluation to Renewable Energy Systems		Lecture Hrs: 10			
Risk Evaluation of Wind Turbine Power Converter System (WTPCS): Power Losses and Temperatures of WTPCS Components, Risk Evaluation of WTPCS - Risk Evaluation of Photovoltaic Power Systems: Two Basic Structures of Photovoltaic Power Systems, Risk Parameters of Photovoltaic Inverters, Risk Evaluation of Photovoltaic Power System						
Textbooks:						
1. Wenyuan Li, “Risk Assessment of Power Systems Models, Methods and Applications”, Wiley Publications, 2 nd Edition, 2014.						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

2. Billinton, Wenyan Li, “Reliability Assessment of Electric Power Systems Using Monte Carlo Methods”, Plenum Press, 1st Edition, 1994.

Reference Books:

1. Nicholas J Bahr, “System Safety Engineering and Risk Assessment – A Practical Approach”, CRC Press Publications, 2nd Edition, 2018.

Online Learning Resources:

1. <https://cleanenergysolutions.org/training/risk-assessment-power-projects>
2. <https://www.graceport.com/help/nfpa-70e-importance-of-risk-assessment-in-electrical-safety-programs>



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code		POWER SYSTEM AUTOMATION	L	T	P	C
Semester	III	(PE-V)	3	0	0	3
Course Objectives: To make the student						
<ul style="list-style-type: none"> Understand the basic concepts of deregulation, power system automation. Analyze about the energy control centers and applications of automation. To apply the techniques to solve the problems in deregulated system and automation. Develop the models to control the system and energy control centers. 						
Course Outcomes (CO): Student will be able to						
CO 1: Understand the concepts of evolution of automation systems, SACADA, Congestion management. CO 2: Analyze the techniques to resolve problems in energy control centers, data ware housing. CO 3: Apply the techniques to get the optimum control in the system by using automation at the substation level and distribution level. CO 4: Develop the real time case studies to solve the critical problems in power system automation.						
UNIT – I	POWER SYSTEM CONTROL AND DEREGULATION		Lecture Hrs: 10			
Introduction – Operation of power systems and modes – Organization and operator activities, Investment factor and control centre experiences – Deregulation – need for deregulation and Advantages of deregulation in power system – Restructuring Models PoolCo. Model – Bilateral Model and Hybrid Model – Independent system operator (ISO) – Role of ISO – Congestion Management.						
UNIT - II	POWER SYSTEM AUTOMATION		Lecture Hrs: 9			
Evolution of automation systems – SCADA in Power system – Building blocks of SCADA system – Remote terminal unit – Intelligent electronic devices – Data concentrators and merging units – SCADA communication systems – Master station – Human-machine interface – Classification of SCADA systems.						
UNIT - III	SUBSTATION AUTOMATION		Lecture Hrs: 10			
Substation automation – Conventional automation – New smart devices for substation automation – new integrated digital substation – Technical issues new digital simulation – Substation automation architectures – Substation automation applications functions – Benefits of data warehousing.						
UNIT - IV	ENERGY CONTROL CENTERS		Lecture Hrs: 10			
Introduction – Energy control centers – EMS framework – Data acquisition and communication – Generation operation and management – Transmission operations – Real time Study-mode Simulations – Post-event analysis and energy scheduling and accounting – Dispatcher training simulator – Smart transmission.						
UNIT - V	DISTRIBUTION AUTOMATION		Lecture Hrs: 10			
Introduction to Distribution automation – Customer, feeder and substation automation – Subsystems in a distribution control center – Distributed Management System (DMS) framework integration with subsystems – Advanced real-time DMS applications – Advanced analytical DMS applications – DMS coordination with other systems.						
Textbooks:						
1. M Shahidehpour, Muwaffaq Alomoush, Restructured electrical power systems operation, trading and volatility, CRC Press, 1 st Edition, 2001. 2. Mini S Thomas and John D Mcdonald, Power System SCADA and Smart Grids, CRC Press, 1 st Edition 2015.						
Reference Books:						
1. Torsten cegrell, Power systems control Technology, Prentice Hall, 1 st Edition, 1986. 2. James Northcote-Green and Robert Wilson, Control and Automation of Electrical Power Distribution Systems, CRC Press, 1 st Edition, 2013.						



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

3. Edmund Handschin, Real time control of Electric Power System, Elsevier Publishing Company, 1 st Edition, 1972.
--

Online Learning Resources:

1. https://nptel.ac.in/courses/108/106/108106022/
--



AUDIT COURSE-I



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
		2	0	0	0
Semester		I			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> Understand the essentials of writing skills and their level of readability Learn about what to write in each section Ensure qualitative presentation with linguistic accuracy 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Understand the significance of writing skills and the level of readability Analyze and write title, abstract, different sections in research paper Develop the skills needed while writing a research paper 					
UNIT - I		10			
Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breakingup Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity					
UNIT - II		10			
Essential Components of a Research Paper- Abstracts- Building Hypothesis-Research Problem -Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization					
UNIT - III		10			
Introducing Review of the Literature – Methodology - Analysis of the Data-Findings - Discussion-Conclusions-Recommendations.					
UNIT - IV		9			
Key skills needed for writing a Title, Abstract, and Introduction					
UNIT - V		9			
Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions					
Suggested Reading					
1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses [Volume-I] 2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press 3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011					



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code	DISASTER MANAGEMENT	L	T	P	C
			2	0	0
Semester		I			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> □ Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response. □ Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives. □ Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations □ Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in 					
UNIT - I					
<p>Introduction: Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.</p> <p>Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post- Disaster Diseases and Epidemics</p>					
UNIT - II					
<p>Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.</p>					
UNIT - III					
<p>Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering Disaster Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.</p>					
UNIT - IV					
<p>Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.</p>					
UNIT - V					
<p>Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.</p>					
Suggested Reading					



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

1. R.Nishith,SinghAK,“DisasterManagementinIndia:Perspectives,issuesandstrategies
2. “New Royal book

- Company..Sahni,PardeepEt.Al.(Eds.),”DisasterMitigationExperiencesAndReflections”,PrenticeHall OfIndia, New Delhi.
3. GoelS.L., Disaster Administration And Management Text and Case Studies”,Deep & Deep Publication Pvt. Ltd., New Delhi



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

Course Code	SANSKRITFOR TECHNICAL KNOWLEDGE	L	T	P	C
		2	0	0	0
Semester		I			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> • To get a working knowledge in illustrious Sanskrit, the scientific language in the world • Learning of Sanskrit to improve brain functioning • Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power • The engineering scholars equipped with Sanskrit will be able to explore the huge • Knowledge from ancient literature 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> • Understanding basic Sanskrit language • Ancient Sanskrit literature about science & technology can be understood • Being a logical language will help to develop logic in students 					
UNIT - I					
Alphabets in Sanskrit,					
UNIT - II					
Past/Present/Future Tense, Simple Sentences					
UNIT - III					
Order, Introduction of roots					
UNIT - IV					
Technical information about Sanskrit Literature					
UNIT - V					
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics					
Suggested Reading					
1. "Abhyaspustakam" –Dr. Vishwas, Sanskrit-Bharti Publication, New Delhi 2. "Teach Yourself Sanskrit" Prathama Deeksha- VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New Delhi Publication 3. "India's Glorious ScientificTradition" Suresh Soni, Ocean books (P) Ltd.,New Delhi					



AUDIT COURSE-II



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code	PEDAGOGY STUDIES	L	T	P	C
		2	0	0	0
Semester		II			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> Review existing evidence on their view topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers. Identify critical evidence gaps to guide the development. 					
Course Outcomes (CO): Student will be able to					
Students will be able to understand: <ul style="list-style-type: none"> What pedagogical practices are being used by teachers informal and informal classrooms in developing countries? What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners? How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? 					
UNIT - I					
Introduction and Methodology: Aims and rationale, Policy background, Conceptual frame work and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and searching.					
UNIT - II					
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.					
UNIT - III					
Evidence on the effectiveness of pedagogical practices, Methodology for the in-depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.					
UNIT - IV					
Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barriers to learning limited resources and large class sizes					
UNIT - V					
Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.					
Suggested Reading					
<ol style="list-style-type: none"> Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261. Agrawal M (2004) Curricular reforms in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379. 					



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering

4. AkyeampongK(2003) Teacher training in Ghana - does it count? Multi-site teacher educationresearch project (MUSTER) country report 1. London: DFID.
5. Akyeampong K, LussierK, PryorJ, Westbrook J (2013) Improving teaching and learning of basicmaths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
6. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
Chavan M (2003)Read India: A mass scale, rapid, ‘learning to read’ campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code	STRESS MANAGEMENT BY YOGA	L	T	P	C
			2	0	0
Semester		II			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> To achieve overall health of body and mind To overcome stress 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> Develop healthy mind in a healthy body thus improving social health also Improve efficiency 					
UNIT - I					
Definitions of Eight parts of yog. (Ashtanga)					
UNIT - II					
Yam and Niyam.					
UNIT - III					
Do`s and Don`t`sin life. i) Ahinsa,satya,astheya,bramhacharyaand aparigrahaii) Shaucha,santosh,tapa,swadhyay,ishwarpranidhan					
UNIT - IV					
Asan and Pranayam					
UNIT - V					
i)Various yoga poses and their benefits formind & body ii) Regularization of breathing techniques and its effects-Types of pranayam					
Suggested Reading					
1.‘Yogic Asanas for Group Tarining-Part-I’: Janardan Swami Yogabhyasi Mandal, Nagpur 2.‘Rajayogaor conquering the Internal Nature’ by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata					



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electrical & Electronics Engineering**

Course Code	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L	T	P	C
			2	0	0
Semester		II			
Course Objectives: This course will enable students:					
<ul style="list-style-type: none"> • To learn to achieve the highest goal happily • To become a person with stable mind, pleasing personality and determination • To awaken wisdom in students 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> □ Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life □ The person who has studied Geeta will lead the nation and mankind to peace and prosperity □ Study of Neeti shatakam will help in developing versatile personality of students 					
UNIT - I					
Neetisatakam- Holistic development of personality Verses-19,20,21,22(wisdom) Verses-29,31,32(pride & heroism) Verses-26,28,63,65(virtue)					
UNIT - II					
Neetisatakam- Holistic development of personality Verses-52,53,59(dont's) Verses-71,73,75,78(do's)					
UNIT - III					
Approach to day-to-day work and duties. Shrimad Bhagwad Geeta: Chapter2-Verses41,47,48, Chapter3-Verses13,21,27,35,Chapter6- Verses5,13,17,23,35,Chapter18-Verses45,46,48.					
UNIT - IV					
Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter2-Verses 56,62,68Chapter12 -Verses13,14,15,16,17,18 Personality of Role model. Shrimad Bhagwad Geeta:					
UNIT - V					
Chapter2-Verses 17, Chapter3-Verses36,37,42,Chapter4-Verses18,38,39 Chapter18- Verses37,38,63					
Suggested Reading					
1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata 2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.					



OPEN ELECTIVE



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electronics and Communication Engineering

Course Code	INDUSTRIAL SAFETY			L	T	P	C
				3	0	0	3
Semester				III			
Course Objectives:							
<ul style="list-style-type: none"> To know about Industrial safety programs and toxicology, Industrial laws, regulations and source models To understand about fire and explosion, preventive methods, relief and its sizing methods To analyze industrial hazards and its risk assessment. 							
Course Outcomes (CO): Student will be able to							
<ul style="list-style-type: none"> To list out important legislations related to health, Safety and Environment. To list out requirements mentioned in factories act for the prevention of accidents. To understand the health and welfare provisions given in factories act. 							
UNIT - I							
Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety colorcodes. Fire prevention and firefighting, equipment and methods.							
UNIT - II							
Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relationship with replacement economy, Service life of equipment.							
UNIT - III							
Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.							
UNIT - IV							
Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.							
UNIT - V							
Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance							
Textbooks:							
1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services. 2. Maintenance Engineering, H. P. Garg, S. Chand and Company.							
Reference Books:							
1. Pump-hydraulic Compressors, Audels, MCGraw Hill Publication. 2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.							



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electronics and Communication Engineering**

Course Code	BUSINESS ANALYTICS				L	T	P	C
		3	0	0	3			
Semester					III			
Course Objectives:								
<ul style="list-style-type: none"> The main objective of this course is to give the student a comprehensive understanding of business analytics methods. 								
Course Outcomes (CO): Student will be able to								
<ul style="list-style-type: none"> Students will demonstrate knowledge of data analytics. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics. Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making. Students will demonstrate the ability to translate data into clear, actionable insights. 								
UNIT - I								
Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.								
UNIT - II								
Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.								
UNIT - III								
Forming Requirements: Overview of Requirements, Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents. Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling								
UNIT - IV								
Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools								
UNIT - V								
Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.								
Textbooks:								
<ol style="list-style-type: none"> Business Analysis by James Cadle et al. Project Management: The Managerial Process by Erik Larson and, Clifford Gray 								
Reference Books:								
<ol style="list-style-type: none"> Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press. Business Analytics by James Evans, persons Education. 								



**Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electronics and Communication Engineering**

Course Code	WASTE TO ENERGY	L	T	P	C
		3	0	0	3
Semester		III			
Course Objectives:					
<ul style="list-style-type: none"> • Introduce and explain energy from waste, classification and devices to convert waste to energy. • To impart knowledge on biomass pyrolysis, gasification, combustion and conversion process. • To educate on biogas properties, bio energy system, biomass resources and their classification and biomass energy programme in India. 					
Course Outcomes (CO): Student will be able to					
<ul style="list-style-type: none"> • To know about overview of Energy to waste and classification of waste. • To acquire knowledge on biomass pyrolysis, gasification, combustion and conversion process in detail. • To gain knowledge on properties of biogas, biomass resources and programmes to convert waste to energy in India. 					
UNIT - I					
Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors					
UNIT - II					
Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.					
UNIT - III					
Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation					
UNIT - IV					
Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.					
UNIT - V					
Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification- pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.					
Textbooks:					
<ol style="list-style-type: none"> 1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 2018 2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., TMH, 2017 					
Reference Books:					
<ol style="list-style-type: none"> 1. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991. 2. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley 					



Sri Krishnadevaraya University College of Engineering & Technology
Ananthapuramu-515003(A.P) India
Electronics and Communication Engineering