K.S.R.M.
COLLEGE OF ENGINEERING

(UGC - Autonomous)
Accredited by NAAC with A+ Grade & B.Tech. (EEE, ECE, CSE, CE and ME) Programs by NBA
An ISO 9001:2015, 14001: 2015 & 50001: 2018 Certified Institution

ACADEMIC REGULATIONS (R25PG)
COURSE STRUCTURE AND SYLLABI

(Effective for the students admitted into I year
from the academic year 2025 -2026 onwards)

MASTER OF TECHNOLOGY (M.Tech.)
POWER SYSTEMS
(REGULAR, FULL-TIME)

K.S.R.M. COLLEGE OF ENGINEERING

VISION:

To evolve as a centre of repute for providing quality academic programs amalgamated with creative learning and research excellence to produce graduates with leadership qualities, ethical and human values to serve the nation.

MISSION:

M1. Provide high quality education with enriched curriculum blended with impactful Teaching-Learning practices.

M2. Promote Research, Entrepreneurship and Innovation through industry collaborations.

M3. Produce highly competent professional leaders for contributing to socio-economic development of the region and the nation.

DEPARTMENT
OF
ELECTRICAL AND ELECTRONICS ENGINEERING

VISION:

To emerge as a department of excellence in the domain of Electrical and Electronics Engineering producing globally competent engineers with research acumen having moral and social values.

MISSION:

M1. To offer education with skill-based curriculum through innovative pedagogy, enabling the students to engage in lifelong learning.

M2. To establish industry interactions for creating research-oriented culture to invoke the desire among the students for pursuing successful career.

M3. To maintain sustainable environment of learning in which students acquire knowledge and imbibed with social and ethical values.

M.Tech Power Systems

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO1. To equip graduates with advanced knowledge and analytical skills in power systems for solving complex engineering problems and conducting quality research.

PEO2. To enable postgraduates to contribute effectively in power utilities, research organizations, academia, and industries by applying appropriate tools and technologies.

PEO3. To foster innovation and promote lifelong learning in emerging areas of power system engineering, smart grids, and renewable energy integration.

PEO4. To develop professional ethics, communication skills, and leadership qualities to work effectively in multidisciplinary teams and contribute to sustainable development.

PROGRAM OUTCOMES (POs):

After successful completion of the program, graduates will be able to

PO1. Apply advanced concepts of power systems to analyze and solve complex engineering problems using modern tools and techniques.

PO2. Conduct research and investigations to address challenges in power generation, transmission, distribution, and integration of renewable energy systems.

PO3. Design efficient and sustainable power system components and processes that meet performance, safety, and environmental requirements.

PO4. Use advanced software, simulation tools, and project management skills for analyzing and executing power system projects.

PO5. Communicate technical information effectively and uphold ethical standards in professional practice and decision-making.

PO6. Pursue lifelong learning and understand the social, environmental, and global impact of power engineering solutions.

K.S.R.M. COLLEGE OF ENGINEERING

(AUTONOMOUS)

Academic Regulations of M.Tech. (Full Time/Regular) Programme

(Effective for the students admitted into I year from the Academic Year 2025-26 and onwards)

K.S.R.M. College of Engineering (KSRMCE) 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.

The affiliating university Jawaharlal Nehru Technological University Anantapur 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 75 credits and secures all 75 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 and are as follows:

Discipline	**Name of the Specialization**	**Code**
Civil Engineering	Geo Technical Engineering	12
Electrical and Electronics Engineering	Power Systems	52
Mechanical Engineering	Renewable Energy	99
Computer Science and Engineering	Artificial Intelligence and Data Science	98
Electronics & Communication Engineering	Embedded Systems & VLSI	84

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 either 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:

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/specialization.
2.	Elective Courses	Professional Elective Courses (PE)	Includes elective courses related to the parent discipline / department / branch of Engineering
		Open Elective Courses (OE)	Elective courses which include inter-disciplinary courses or courses in an area outside the parent discipline which are of importance in the context of special skill development
3.	Mandatory Courses	Quantum Technology and Application	To understand importance of latest technologies, research and process of creation of patents through research
		Research methodology & IPR	
4.		Skill Enhancement courses (SE)	Interdisciplinary / job-oriented / domain courses which are relevant to the industry
		Comprehensive Viva	To test the overall domain knowledge

S. No.	Broad Course Classification	Course Category	Description
		Short Term Industry Internship	To provide real time exposure
		Dissertation	To provide application of domain knowledge to solve real problems
5.	Audit Courses	Mandatory non-credit courses	Covering courses of developing desired attitude among the learners.

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 Semester-End examinations if he/she acquires i) a minimum of 50% attendance in each course and ii) 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 semester-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 course - wise (irrespective of credits assigned), for a maximum of 100 marks for theory and 100 marks for practical, based on Internal Evaluation and Semester-End Examination.

8.1 There shall be five units in each of the theory courses. For the theory courses 60 marks will be for the Semester-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 period. The

other 10 marks is awarded for continuous assessment in the form of assignments, quizzes, open book examination, presentation, etc. 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) and each question carries 10 marks. Final Internal marks for a total of 40 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.

8.3 The following pattern shall be followed in the End Examination:

i. Five questions shall be set from each of the five units with either/or type for 12 marks each.
ii. All the questions have to be answered compulsorily.
iii. Each question may consist of one, two or more sub-questions.

8.4 For practical courses, 60 marks shall be for the Semester-End 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 semester-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 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 for every six months/semester satisfying the conditions mentioned in item 1 & 2 of the regulations.

8.6 A candidate shall be deemed to have secured the minimum academic requirement in a course if he secures a minimum of 40% of marks in the Semester-End Examination and a minimum aggregate of 50% of the total marks in the Semester-End Examination and Internal Evaluation taken together.

8.7 In case the candidate does not secure the minimum academic requirement in any of the courses he/she has to reappear for the Semester-End Examination either supplementary or regular in that course or repeat the course when next offered or do any other specified course as may be required.

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

9. Credit Transfer Policy

As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, students are allowed to do up to a maximum of 40% of the Professional and Open Electives in a semester through SWAYAM/SWAYAM Plus.

9.1 The college offers 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 college, it is mandatory for the student to share necessary information with the college

9.4 The institution will list out 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 will notify at the beginning of semester the list of the online learning courses eligible for credit transfer in the forthcoming Semester.

9.6 Students may register for an 8-week (2 credits) or 12-week (3 credits) SWAYAM / SWAYAM plus course with the approval of the Head of the Department (HoD).

9.7 Examination fees, if applicable, shall be borne by the student. Pass marks and grading will be as per the JNTUA academic regulations.

9.8 A student must get minimum 40% marks for assignments and quizzes on the SWAYAM/ SWAYAM plus platform to be eligible for the semester-end examination. The students who are unable to get minimum internal marks in SWAYAM/ SWAYAM plus platform, they have to re-register for the course in subsequent semester through SWAYAM/ SWAYAM plus platform.

9.9 The semester-end exam may be conducted by the National Testing Agency (NTA), the National Programme on Technology Enhanced Learning (NPTEL) or the College during the regular end-term exams. Evaluation shall comprise 60% weightage for the semester-end examination and 40% for assignments and quizzes conducted by the SWAYAM/ SWAYAM plus course coordinator. The student has to get 50% marks for internal and external with minimum of 40% marks in the external examination to declare them as pass.

9.10 The institution also ensures that the student completes the course and produces the course completion certificate as per the academic schedule given for the regular courses in that semester. However, the credits will be transferred to the students who got minimum 50% marks with 40% marks in the external examination

9.11 The institution will designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.

9.12 The college will ensure no overlap of SWAYAM MOOC exams with that of the semester-end examination schedule. In case of delay in SWAYAM results, the college will re-issue the marks sheet for such students.

9.13 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 minimum 50% of marks and grades.

9.14 The institution maintains the following in the examination section and submits as and when demanded by 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.

9.15 The college will 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 are also be permitted to register for MOOCs offered through online platforms other than SWAYAM NPTEL. In such cases, credit transfer shall be permitted only after seeking approval of the Principal with the recommendations of the concerned HoD and Dean, Academics at least three months prior to the commencement of the semester.

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

A candidate shall be given one chance to re-register for each course 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 courses for which the Internal Evaluation marks secured are more than 50%.

10.3 Out of the courses 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 course and for a maximum of **three** Theory courses for Improvement of Internal evaluation marks.

10.4 The candidate has to re-register for the chosen courses and fulfill the academic requirements.

10.5 For re-registration, the candidates have to apply to the Principal through the respective HoD by paying the requisite fees and get approval from the Principal 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 Semester-End Examinations marks secured in the previous attempt(s) for the reregistered courses 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. Progress of the project work is monitored through three reviews:

- Project review – I at the beginning of the III semester for zero marks
- Project review – II at the end of the third semester for 100 marks
- Project review – III before submission of the thesis i.e., end of the IV semesters for 100 marks

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 requirements in all the courses, 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.

11.3 Project work shall be carried out under the supervision of teacher in the parent department concerned.

11.4 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.

11.5 Continuous assessment of Project Work - I and Project Work – II in III & IV semesters respectively will be monitored by the PRC.

11.6 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.

11.7 After registration, a candidate must present in Project 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. Student shall initiate the project work, only after obtaining the approval of the PRC.

11.8 The Project 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.

11.9 A candidate has to secure a minimum of 50% of marks to be declared successful in Project Review - II. Only after successful completion of Project Review – II, candidate shall be permitted for Project Work Review – III in IV Semester. The unsuccessful students in Project Review - II shall reappear after three months.

11.10 The Project 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 Review - III. If student fails to obtain the required minimum marks, he/she has to reappear for Project Review - III after a month.

11.11 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.

11.12 After approval from the PRC, the student is permitted to submit a report. The dissertation report will be accepted only when the plagiarism is within 30% checked through Turnitin software (repository mode). The plagiarism report shall be submitted along with the dissertation report.

11.13 Research paper related to the Project Work shall be published in an SCI/ESCI/Scopus/UGC Care listed journal, or in conference proceedings with ISBN number organized by professional societies such as IEEE, IEI, etc.

11.14 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.

11.15 The dissertation shall be adjudicated by an external examiner selected by the College. For this, a panel of three examiners shall be submitted by the supervisor concerned and department head for each student. However, the dissertation will be adjudicated by one examiner nominated by the Principal.

11.16 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 Principal.

11.17 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.

11.18 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 has to secure a minimum of 50% marks in Viva voce exam.

11.19 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 Industry Internships:

Industry internship either onsite or virtual with a minimum of 06-08 weeks duration, done at the end of 1st year second semester. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the PG program. The student shall register for the internship as per course structure after commencement of academic year.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, Mentor/Supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. Internship will be evaluated for 100 marks with 50 marks for the report evaluated by the mentor and 50 marks for oral presentation. A student should secure minimum 50% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the College.

13 Comprehensive Viva

A Comprehensive Viva shall be conducted after the II Semester examinations for 100 marks by a committee consisting of the Head of the Department, one senior faculty member of the same specialization, and an external subject expert appointed by the Principal. The student must secure a minimum of 50% marks to be declared as passed

14 Credits for Co-curricular Activities

A Student should earn 01 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)	0.5
Participation in International Level Seminar / Conference / Workshop / Training programs held outside India (related to the specialization of the student)	1
Academic Award/Research Award from State Level / National Agencies	0.5
Academic Award / Research Award from International Agencies	1
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	0.5
Research / Review Publication in International Journals with Editorial board outside India (Indexed in Scopus / Web of Science)	1

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. A minimum participation of five days is required to earn the necessary credits. Alternatively, the student may attend five different one day programs to meet this requirement.

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

15 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 course 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
Absent	Ab (Absent)	0

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

ii) 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.,

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

where, C_i is the number of credits of the i^{th} course and G_i 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.,

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

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

16 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:

Class Awarded	CGPA to be secured
First Class with Distinction	≥7.5%
First Class	< 7,5≥ 6.5
Pass Class	< 6.5

17 **Exit Policy:**

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

The Academic Council 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.

18 Withholding of Results:

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

19 **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 courses as and when courses are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

20 General:

20.1 The academic regulations should be read as a whole for purpose of any interpretation.

20.2 Disciplinary action for Malpractice / improper conduct in examinations is appended.

20.3 There shall be no places transfer within the constituent colleges and affiliated colleges of Jawaharlal Nehru Technological University Anantapur.

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

20.5 In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

20.6 The College 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 College.

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RULES FOR

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

S.No.	Nature of Malpractices / Improper conduct	Punishment
	If the candidate:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course 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 course of the examination).	Expulsion from the examination hall and cancellation of the performance in that course only.
1.(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course 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 course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses 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 courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for four consecutive semesters from class work and all University examinations if his

S.No.	Nature of Malpractices / Improper conduct	Punishment
	If the candidate:	
		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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses 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 course 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	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses 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.

S.No.	Nature of Malpractices / Improper conduct	Punishment
	If the candidate:	
	of the examination.	
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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses 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	Possessany lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses 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 course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester / year. The candidate is also debarred and forfeits the seat. Person (s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester / year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course only or in that course and all other courses the candidate has appeared including practical examinations and project work of that semester / year

S.No.	Nature of Malpractices / Improper conduct	Punishment
	If the candidate:	
		examinations, depending on the recommendation of the committee.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the 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 course/courses due to Malpractice, he has to register for End Examinations in that course/courses consequently and has to fulfil all the norms required for the award of Degree.

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COURSE STRUCTURE
M.Tech. POWER SYSTEMS
I-SEMESTER

S. No.	Course Code	Course Title	Category	Hours per week			Credits
				L	T	P	
1.	2552101	Advanced Power System Protection	PC	3	0	0	3
2.	2552102	Power System Security and State Estimation	PC	3	0	0	3
3.	**Program Elective-I**		PE	3	0	0	3
	2552103	Energy Auditing and Management					
	2552104	Modelling and Analysis of HVDC Systems					
	2552105	Power System Optimization					
4.	**Program Elective-II**		PE	3	0	0	3
	2552106	Solar & Wind Energy Conversion Systems					
	2552107	Smart Grid Technologies					
	2552108	E-Mobility					
5.	2552151	Power System Analysis and Protection Lab	PC	0	0	4	2
6.	2552152	Power Systems Simulation Lab	PC	0	0	4	2
7.	2552153	AI Techniques in Electrical Engineering	SE	0	1	2	2
8.	2599171	Research Methodology and Intellectual Property Rights	MC	2	0	0	2
9.	**Audit Course–I**		AC	2	0	0	2
	2599181	English for Research Paper Writing					
	2512181	Disaster Management					
	2598181	Essence of Indian Traditional Knowledge					
			TOTAL	**16**	**1**	**10**	**22**

2552101	M.Tech., I-SEMESTER ADVANCED POWER SYSTEM PROTECTION (POWER SYSTEMS)	L	T	P	C
		3	0	0	3

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. analyze static relay structures and comparator characteristics.
CO2. evaluate static overcurrent and differential relay performance.
CO3. assess distance relay operation and impacts of power swings.
CO4. implement microprocessor-based relay algorithms for protection.
CO5. apply AI techniques for intelligent protection and fault classification.

SYLLABUS:

UNIT–I: STATIC RELAYS & COMPARATORS (09 Periods)

Introduction to Static relays – Basic construction of Static relays – Level detectors – Replica Impedance– Mixing circuits– General equation for two input Phase and Amplitude Comparators – Duality between Amplitude and Phase Comparator.

Comparators: Types of Amplitude Comparators and Phase Comparators, Multi –Input Comparators: Conic section characteristics Three input amplitude comparator – Hybrid comparator – Switched distance schemes – Polyphase distance schemes– Phase fault scheme – Three phase scheme – Combined and ground fault scheme.

UNIT-II: STATIC OVER CURRENT AND DIFFERENTIAL RELAYS (09 Periods)

Introduction– Instantaneous over current relay – Time over current relays – 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: STATIC DISTANCE RELAYS AND POWER SWINGS (09 Periods)

Static Distance Relays: Static Impedance – Reactance – MHO and Angle Impedance relay Sampling comparator – Realization of reactance and MHO relay using a sampling comparator.

Power Swings: 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-IV: MICROPROCESSOR BASED PROTECTIVE RELAYS (09 Periods)

Over current relays – Impedance relays – Directional relay – Reactance relay (Block diagram and flow chart approach only). Generalized mathematical expression for Distance relays– Measurement of R and X – MHO and offset MHO relays – Realization of MHO characteristics – Realization of Offset MHO characteristics (Block diagram and flow chart approach only) – Quadrilateral Relay –Basic principle of Digital computer relaying.

UNIT-V: ARTIFICIAL INTELLIGENCE BASED NUMERICAL PROTECTION

(09 Periods)

Application of Artificial Intelligence to Power System Protection – Application of ANN to Overcurrent Protection – Application of ANN to Transmission Line Protection – Neural Network Based Directional Relay – ANN Modular Approach for Fault Detection, Classification and

Location – Wavelet Fuzzy Combined Approach for Fault Classification – Application of ANN to Power Transformer – Power Transformer Protection Based on Neural Network and Fuzzy Logic – Power Transformer Protection Based Upon Combined Wavelet Transform and Neural Network – Application of ANN to Generator Protection.

Total Periods: 45

Textbooks:

T1. T.S. Madhava Rao, Power system Protection static relay, Tata McGrawHill Publishing Company limited, 2nd Edition, 2004.

T2. Badri Ram and D.N. Vishwakarma, Power system Protection and Switchgear, Tata McGraw Hill Publication Company limited, 2nd Edition, 2013.

Reference Books:

R1. Bhavesh Bhalja, R. P. Maheshwari, N. G. Chothani, Protection and Switchgear, Oxford University Press, 2nd Edition, New Delhi, India, 2018.

R2. Oza, B. A., N. C. Nair, R. P. Mehta, et al., Power System Protection & Switchgear, Tata McGraw Hill, New Delhi, 1st Edition, 2011.

Online Learning Resources:

1. https://nptel.ac.in/courses/108105167
2. http://www.digimat.in/nptel/courses/video/108107167/L03.html

2552102	M.Tech., I-SEMESTER POWER SYSTEM SECURITY AND STATE ESTIMATION (POWER SYSTEMS)	L	T	P	C
		3	0	0	3

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. formulate and compute bus matrices using systematic algorithms.

CO2. assess power system security using DC load-flow methods.

CO3. analyze contingencies using sensitivity-based techniques.

CO4. implement state estimation using least-squares and orthogonal methods.

CO5. evaluate ATC, congestion and wheeling transactions in deregulated systems.

SYLLABUS:

UNIT-I: POWER SYSTEM NETWORK MATRICES (09 Periods)

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 – ∏-representation of off-nominal tap transformers.

UNIT–II: POWER SYSTEM SECURITY-I (09 Periods)

Review of power flow methods (qualitative treatment only)– DC power flow method- Introduction to power system security – Factors influencing power system security.

UNIT-III: POWER SYSTEM SECURITY-II (09 Periods)

Introduction to contingency analysis – Contingency analysis: Detection of Network problems, linear sensitivity factors –AC power flow methods– Contingency selection.

UNIT-IV: STATE ESTIMATION IN POWER SYSTEM (09 Periods)

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 (09 Periods)

Need and conditions for deregulation–Electricity sector structure model – Power wheeling transactions –Congestion management methods– Available Transfer Capability (ATC) – System security in deregulation.

Total Periods: 45

Textbooks:

T1. Allen J. Wood and Wollenberg B.F., Power Generation Operation and control, John Wiley & Sons, 3rd edition, 2013.

T2. 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:

R1. Nagrath I.J. and Kothari D.P., Modern Power System Analysis, TMH, New Delhi, 3rd Edition, 2004.

R2. 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

2552103	M.Tech., I-SEMESTER ENERGY AUDITING AND MANAGEMENT (POWER SYSTEMS)	L	T	P	C
		3	0	0	3

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. assess DSM options and audit requirements in utility systems.
CO2. conduct industrial energy audits and identify conservation opportunities.
CO3. interpret measurements from audit instrumentation for system evaluation.
CO4. analyze conservation strategies for HVAC, lighting, and thermal systems.
CO5. evaluate economic benefits of conservation measures in electrical systems.

SYLLABUS:

UNIT-I: ENERGY AUDIT AND DEMAND SIDE MANAGEMENT (DSM) IN POWER UTILITIES (09 Periods)

Energy Scenario & Conservation -Demand Forecasting Techniques- Integrated Optimal Strategy for Reduction of T&D Losses - DSM Techniques and Methodologies- Loss Reduction in Primary and Secondary Distribution system and capacitors - Energy Management – Role of Energy Managers – Energy Audit-Metering.

UNIT-II: ENERGY AUDIT (09 Periods)

Energy audit concepts - Basic elements and measurements - Mass and energy balances - Scope of energy auditing in industries - Evaluation of energy conserving opportunities and environmental management - Preparation and presentation of energy audit reports - case studies and potential energy savings.

UNIT-III: INSTRUMENTATION (09 Periods)

General Audit Instrumentation –Measuring building losses – Applications of IR thermography – Measurement of electrical system performance – Measurement of heating, ventilation, air conditioning system performance – Measurement of combustion systems.

UNIT-IV: ENERGY CONSERVATION (09 Periods)

Energy conservation in HVAC systems and thermal power plants, Solar systems, Fan and Lighting Systems - Different light sources and luminous efficiency

UNIT-V: ECONOMIC EVALUATION OF ENERGY CONSERVATION (09 Periods)

Energy conservation in electrical devices and systems - Economic evaluation of energy conservation measures - Electric motors and transformers - Inverters and UPS - Voltage stabilizers.

Total Periods: 45

Textbooks:

T1. Frank Kreith and D. Yogi Goswamy/ Editors, "Energy Management and conservation handbook". NewYork,2008.
T2. WC Turner: Energy Management Handbook, Seventh Edition, (Fairmont Press Inc., 2007)
T3. YP Abbi and Shashank Jain: Handbook on Energy Audit and Environment Management, (TERI Press, 2006)

Reference Books:

R1. Albert Thumann, and William J. Younger, "Handbook of Energy Audits", Marcel Dekker, Inc., New York, 6th edition, 2003.
R2. D.A. Reay, Industrial Energy Conservation-Pergamon Press, 1980.
R3. T.L. Boten, Liptak B.G., (Ed)Instrument Engineers Handbook, Chinton Book Company, 2004.

R4. Hodge B.K, Analysis and Design of Energy Systems, Prentice Hall, 2002.
R5. Larry C. Witte, Schmidt & Brown, Industrial energy management and utilization. Hemisphere Publishing, Co. NewYork,1988.

Online Learning Resources:

1. https://onlinecourses.swayam2.ac.in/nou23_es05/preview
2. https://onlinecourses.nptel.ac.in/noc25_ar10/preview

2552104	M.Tech., I-SEMESTER MODELLING AND ANALYSIS OF HVDC SYSTEMS (POWER SYSTEMS)	L	T	P	C
		3	0	0	3

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. analyze converter characteristics and DC link control strategies.
CO2. develop AC/DC power-flow models and solve hybrid load-flow problems.
CO3. assess transient and dynamic stability of HVDC-linked systems.
CO4. analyze harmonic and torsional interactions in HVDC environments.
CO5. develop digital simulation models for converters and DC networks.

SYLLABUS:

UNIT–I: HVDC CONVERTERS AND SYSTEM CONTROL (09 Periods)

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 (09 Periods)

Modeling of HVDC Components: HVDC Converter model - Converter control - Modeling of DC network - Modeling of AC Network.

Power flow analysis in AC/DC systems: Modeling 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 (09 Periods)

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 (09 Periods)

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 (09 Periods)

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. HVDC Breakers, Monopolar Operation.

Total Periods: 45

Textbooks:

T1. K.R. Padiyar, HVDC Power Transmission Systems – Technology & System Interactions, New Age International Publishers, 3rd Edition, 2017.
T2. S Kamakshaiah and V Kamaraju, HVDC Transmission, Tata Mc Graw Hill, New Delhi, 2nd Edition, 2021.

Reference Books:

R1. E.W. Kimbark, Direct current transmission, Wiely Inter Science – New York, 1st Edition, 1971
R2. J. Arillaga, HVDC Transmission, Peter Peregrinus Ltd., London UK 2nd Edition, 1998.
R3. E. Uhlman, Power transmission by direct current, Springer Verlag, Berlin Helberg, 1st Edition, 1985.

Online Learning Resources:

1. https://www.youtube.com/watch?v=yP7OACmLP48

2552105	M.Tech., I-SEMESTER POWER SYSTEM OPTIMIZATION (POWER SYSTEMS)	L	T	P	C
		3	0	0	3

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. apply classical optimization tools including KKT and interior-point methods.
CO2. implement PSO variants for power system optimization tasks.
CO3. analyze ant-colony search behaviour for solving optimization problems.
CO4. apply Tabu-search strategies for constrained and unconstrained problems.
CO5. evaluate optimization techniques for real-time power system applications.

SYLLABUS:

UNIT–I: CONVENTIONAL OPTIMIZATION TECHNIQUES (09 Periods)

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.

UNIT–II: FUNDAMENTALS OF PARTICLE SWARM OPTIMIZATION (PSO) TECHNIQUE (09 Periods)

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. Problem formulation of VVC, VVC using PSO

UNIT-III: FUNDAMENTALS OF ANT COLONY SEARCH ALGORITHMS (09 Periods)

Ant Colony Search Algorithm – Behavior 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–IV: FUNDAMENTALS OF TABU SEARCH (09 Periods)

Overview of the Tabu Search Approach – Problem Formulation – Coding and Representation – Neighbourhood Structure – Characterization of the Neighbourhood – 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–V: APPLICATION TO POWER SYSTEMS (09 Periods)

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.

Total Periods: 45

Textbooks:

T1. A Ravindran, K.M. Ragsdell, and G.V. Reklaitis, "Engineering optimization: Methods and applications", Wiley India Edition.
T2. Kwang Y. 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
T3. D. P. Kothari and J. S. Dhillon, "Power System Optimization", PHI Learning Private Limited,

2nd Edition, 2011.

Reference Books:

R1. Jizhong Zhu, "Optimization of power system operation", IEEE Press, John *Wiley* & Sons, Inc., *Publication, 2nd edition, 2015*.
R2. Joshua adam Taylor, "Convex optimization of power systems'', Cambridge University Press, 1st edition, 2015.

Online Learning Resources:

1. https://nptel.ac.in/courses/112/106/112106064/

2552106	M.Tech., I-SEMESTER SOLAR AND WIND ENERGY CONVERSION SYSTEMS (POWER SYSTEMS)	L	T	P	C
		3	0	0	3

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. analyze solar radiation models and aerodynamic behaviour of wind turbines.
CO2. evaluate PV module performance under mismatch and environmental effects.
CO3. design standalone and grid-connected PV systems using sizing methodology.
CO4. analyze wind turbine control approaches and site-specific performance.
CO5. assess variable-speed wind technologies and hybrid energy integrations.

SYLLABUS:

UNIT- I: SOLAR AND WIND FUNDAMENTALS (09 Periods)

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 – Issues due to integration of solar and wind energy systems.

UNIT- II: SOLAR PHOTOVOLTAIC MODULES (09 Periods)

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 (09 Periods)

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 (09 Periods)

Wind Turbine - Torque speed characteristics – Modelling of wind turbines, 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: GENERATION WITH VARIABLE SPEED TURBINES AND APPLICATIONS (09 Periods)

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

Total Periods: 45

Textbooks:

T1. Solar Photovoltaics Fundamentals, Technologies and Applications, Chetan Singh Solanki, PHI publications, 2015, 3rd edition.

T2. Wind Electrical Systems, S.N. Bhadra, D. Kastha, S. Banerjee, Oxford University Press, 2013, 1st edition.

T3. Engineering of Wind Energy, Banshi D. Shukla, Jain Brothers, 2018, 1st edition.

Reference Books:

R1. Solar Energy Fundamentals and applications, H.P. Garg, J. Prakash, Tata McGraw- Hill publishers, 2000, 1st edition.

R2. Energy Technology, S. Rao & B.B. Parulekar, Khanna publishers, 2005, 4th edition.

R3. Renewable Energy sources & Conversion Technology, N.K. Bansal, M. Kleemann, Michael Meliss, Tata McGraw Hill Publishers & Co., 1990, 1st edition.

Web Resources:

1. https://www.youtube.com/watch?v=yKgKW4K9ILU
2. http://www.digimat.in/nptel/courses/video/103103206/L37.html

2552107	M.Tech., I-SEMESTER SMART GRID TECHNOLOGIES (POWER SYSTEMS)	L	T	P	C
		3	0	0	3

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. analyze technological enhancements enabled by smart grid architectures.
CO2. apply modeling and analytical tools for T&D system management.
CO3. evaluate smart metering systems and demand-side integration mechanisms.
CO4. compare communication technologies used in modern smart grids.
CO5. assess security mechanisms including encryption, signatures, and authentication.

SYLLABUS:

UNIT–I: SMART GRIDS (09 Periods)

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 (09 Periods)

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 (09 Periods)

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, Neighbourhood 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 (09 Periods)

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 (09 Periods)

Overview- Encryption and Decryption, Symmetric Key Encryption- Public Key Encryption-Authentication- Authentication Based on Shared Secret Key- Authentication Based on Key

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

Total Periods: 45

Textbooks:

T1. Janaka Ekanayake, Kithsiri Liyanage, et.al., Smart Grid Technology and Applications, Wiley Publications, 1st edition, 2012.

T2. James Momoh, Smart Grid: Fundamentals of Design and Analysis, Wiley, IEEE Press, 1st edition, 2012.

T3. Bharat Modi, Anuprakash, Yogesh Kumar, Fundamentals of Smart Grid Technology, S.K Kataria& Sons, 1st edition, 2019.

Reference Books:

R1. 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.

R2. Nouredine Hadjsaid, Jean Claude Sabonnadiere, Smart Grids, Wiley Blackwell Publications, 1st edition, 2012.

R3. Peter-Fox Penner, Smart Power: Climate Changes, the Smart Grid and the future of electric utilities, Island Press, 1st edition, 2010.

Online Learning Resources:

1. www.indiasmartgrid.org

2552108	M.Tech., I-SEMESTER E-MOBILITY (POWER SYSTEMS)	L	T	P	C
		3	0	0	3

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. analyze EV configurations and quantify system-level performance parameters.
CO2. evaluate propulsion options and model vehicle dynamics.
CO3. assess fuel-cell characteristics and hybrid EV architectures.
CO4. implement battery-charging and control schemes for EV systems.
CO5. analyze energy-storage technologies and their integration into EV/grid systems.

SYLLABUS:

UNIT–I: INTRODUCTION TO EV SYSTEMS AND ENERGY SOURCES (09 Periods)

Past, Present and Future of EV - EV Concept- EV Technology- State-of-the Art of EVs- EV configuration- EV system- Fixed and Variable gearing- Single and multiple motor drive- In-wheel drives- EV parameters: Weight, size, force and energy, performance parameters.

Electro mobility and the environment- History of Electric power trains- Carbon emissions from fuels- Green houses and pollutants- Comparison of conventional, battery, hybrid and fuel cell electric systems.

UNIT–II: EV PROPULSION AND DYNAMICS (09 Periods)

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- Linear Induction Motors Vehicle load factors- Vehicle acceleration.

UNIT-III: FUEL CELLS (09 Periods)

Introduction of fuel cells- Basic operation- Model - Voltage, power and efficiency- Power plant system – Characteristics- Sizing - Example of fuel cell electric vehicle.

Introduction to HEV- Brake specific fuel consumption - Comparison of Series-Parallel hybrid systems- Examples.

UNIT–IV: BATTERY CHARGING AND CONTROL (09 Periods)

Battery charging: Basic requirements- Charger architecture- Charger functions- Wireless charging- Power factor correction.

Control: Introduction- Modeling of electro mechanical system- Feedback controller design approach- PI controllers designing- Torque-loop, Speed control loop compensation- Acceleration of battery electric vehicle.

UNIT–V: ENERGY STORAGE TECHNOLOGIES (09 Periods)

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- Hybrid energy storage systems -Battery SCADA.

Total Periods: 45

Textbooks:

T1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001,1st Edition

T2. 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

Reference Books:

R1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2021,3rd Edition.
R2. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2015,1st Edition
R3. 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.
R4. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004,1st Edition
R5. 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

2552151	M.Tech., I-SEMESTER POWER SYSTEM ANALYSIS AND PROTECTION LAB (POWER SYSTEMS)	L	T	P	C
		0	0	4	2

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. analyze power system parameters through experimental procedures involving machine characteristics, relay testing, and fault analysis

CO2. interpret experimental and computed results to assess relay performance and system behaviour under various fault and operating conditions.

CO3. develop protection strategies and relay configurations based on laboratory investigations and simulation results.

CO4. able to apply appropriate Tools and Techniques to understand and analyze the problems following professional ethics with focus on societal and environmental aspects.

CO5. work as a team and communicate results in an effective way.

CO6. make decisions as an individual or as team member to manage tasks and also engage in independent and life-long learning with ability to adapt to new and technological changes.

SYLLABUS:

List of Experiments:

1. Determination of Subtransient Reactance and Time Constant of a Salient Pole Machine
2. Determination of Sequence Impedances of a Cylindrical Rotor Synchronous Machine
3. Fault Analysis
   i) LG Fault
   ii) LL Fault
   iii) LLG Fault
   iv) LLLG Fault
4. Equivalent Circuit of a Three Winding Transformer
5. Separation of No-Load losses of a Three Phase Squirrel Cage Induction Motor
6. Power Angle Characteristics of a Salient Pole Synchronous Machine
7. Characteristics of Static/Numeric Over Current Relay
8. Characteristics of Static Negative Sequence Relay
9. Characteristics of Static/Numeric Over Voltage Relay
10. Characteristics of Static/Numeric Percentage Biased Differential Relay
11. Testing of Buchholz Relay
12. Testing of Frequency Relay
13. Testing of Reverse Power Relay
14. Testing of Earth fault Relay
15. Microprocessor Based Relay

Web Sources:

1. https://www.vlab.co.in

2552152	M.Tech., I-SEMESTER POWER SYSTEMS SIMULATION LAB (POWER SYSTEMS)	L	T	P	C
		0	0	4	2

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. develop simulation models for load flow, stability, contingency, and harmonic studies using appropriate computational tools

CO2. analyze system performance under varying operating and disturbance scenarios through simulation outputs

CO3. apply simulation-based insights to design improved solutions for power-flow, protection, and power-quality issues

CO4. able to apply appropriate Tools and Techniques to understand and analyze the problems following professional ethics with focus on societal and environmental aspects.

CO5. work as a team and communicate results in an effective way.

CO6. make decisions as an individual or as team member to manage tasks and also engage in independent and life-long learning with ability to adapt to new and technological changes.

SYLLABUS:

List of Experiments:

1. Y - Bus Formation
2. Z- Bus Formation
3. Gauss – Seidel Load Flow Analysis
4. Newton-Raphson Method for Load Flow Analysis
5. Fast Decoupled Load Flow Analysis
6. Fast Decoupled Load Flow Analysis for Distribution Systems
7. Point by Point Method
8. Computation of Available Transfer Capabilities
9. Contingency analysis
10. State estimation using Weighted Least Square, linear and non-linear methods
11. Simulation of power quality problems (Sag/Swell, interruption, transients, harmonics, flickers etc.)
12. Harmonic analysis and Single tuned filter design to mitigate harmonics
13. Harmonic analysis and Double tuned filter design to mitigate harmonics

Web Sources:

1. https://www.vlab.co.in

2552153	M.Tech., I-SEMESTER AI TECHNIQUES IN ELECTRICAL ENGINEERING (POWER SYSTEMS)	L	T	P	C
		0	1	2	2

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. analyze neural network architectures and apply learning mechanisms for engineering problem formulation.

CO2. develop fuzzy inference systems and genetic algorithm models for optimization and control tasks.

CO3. apply ANN, fuzzy logic, and GA techniques to solve power system applications such as forecasting, dispatch, and control.

CO4. able to apply appropriate Tools and Techniques to understand and analyze the problems following professional ethics with focus on societal and environmental aspects.

CO5. work as a team and communicate results in an effective way.

CO6. make decisions as an individual or as team member to manage tasks and also engage in independent and life-long learning with ability to adapt to new and technological changes.

SYLLABUS

UNIT-I: ARTIFICIAL NEURAL NETWORKS (09 Periods)

Introduction-Models of Neural Network - Architectures – Knowledge representation – Artificial Intelligence and Neural networks – Learning process – Error correction learning – Hebbian learning – Competitive learning – Boltzmann learning – Supervised learning –Unsupervised learning – Reinforcement learning -learning tasks.

UNIT-II: ANN PARADIGMS (09 Periods)

Multi – layer perceptron using Back propagation Algorithm-Self – organizing Map –Radial Basis Function Network–Functional link network– Hopfield Network.

UNIT-III: FUZZYLOGIC (09 Periods)

Introduction – Fuzzy versus crisp – Fuzzy sets - Membership function – Basic Fuzzy set operations –Properties of Fuzzy sets – Fuzzy Cartesian Product – Operations on Fuzzy relations – Fuzzy logic – Fuzzy Quantifiers-Fuzzy Inference- Fuzzy Rule based system– Defuzzification methods.

UNIT-IV: GENETIC ALGORITHMS (09 Periods)

Introduction-Encoding– Fitness Function-Reproduction operators–Genetic Modeling –Genetic operators- Crossover- Single–site crossover –Two-point crossover–Multi point crossover-Uniform crossover–Matrix crossover-Crossover Rate-Inversion & Deletion–Mutation operator–Mutation– Mutation Rate-Bit-wise operators-Generational cycle-convergence of Genetic Algorithm.

UNIT-V: APPLICATIONS OF AI TECHNIQUES (09 Periods)

Load forecasting – Load flow studies – Economic load dispatch –Load frequency control – Single area system and two area system – Small Signal Stability (Dynamic stability)- Reactive power control – speed control of DC and AC Motors.

Total Periods: 45

Textbooks:

T1. S. Rajasekaran and G.A.V. Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms" PHI, New Delhi, 2nd edition,2017.

T2. Sudarshan K. Valluru and T. Nageswara Rao, “introduction to Neural Networks, Fuzzy Logic & Genetic Algorithms”, Jaico Publishing House, 1st edition, 2010.

Reference Books:

R1. P.D. Wasserman, VanNostrand Reinhold, “Neural Computing Theory & Practice”, NewYork,1st Edition ,1989
R2. Bart Kosko, “Neural Network & Fuzzy System”, Prentice Hall,1992.
R3. G.J. Klir and T.A. Folger, “Fuzzy sets, Uncertainty and Information”, Pearson, 1st edition, 2015.
R4. D.E. Goldberg, “Genetic Algorithms”, Pearson Education India, 1st edition, 2008.

Online Learning Resources:

1. https://onlinecourses.swayam2.ac.in/ntr24_ed08/preview
2. https://onlinecourses.nptel.ac.in/noc23_ge36/preview
3. https://onlinecourses.nptel.ac.in/noc22_hs59/preview

	M.Tech., I-SEMESTER	L	T	P	C
2599171	**RESEARCH METHODOLOGY AND INTELLECTUAL PROPERTY RIGHTS** (Common to AIDS, PS, Geo-Tech, RE, ES&VLSI) **(MANDATORY COURSE)**	**2**	**0**	**0**	**2**

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. Demonstrate the research process, types and methods, use data correctly, follow ethical rules, and use proper citation styles.

CO2. Apply appropriate data collection methods, identify data types and sources, ensure quality, and follow ethical practices using suitable tools.

CO3. Apply multivariate analysis and experimental design to study cause-effect relationships, ensure measurement validity, and write structured research papers and proposals.

CO4. Demonstrate the concept, evolution, and types of Intellectual Property Rights (IPR), recognize global IPR practices and institutions like WIPO, WTO, and UNESCO, and identify key agreements, trade secrets, and biodiversity-related rights.

CO5. Demonstrate the concept, features, and benefits of patents; identify types of patent applications and the filing process; and explain the roles of patent agents, licensing, and patent regulations.

SYLLABUS:

UNIT-I: FUNDAMENTALS OF RESEARCH METHODOLOGY (09 Periods)

Overview of research process and design - Types of Research - Approaches to Research (Qualitative vs Quantitative) - Observation studies, Experiments and Surveys - Use of Secondary and exploratory data to answer the research question - Importance of Reasoning in Research and Research ethics - Documentation Styles (APA/IEEE etc.) - Plagiarism and its consequences.

UNIT-II: DATA COLLECTION AND SOURCES (09 Periods)

Importance of Data Collection - Types of Data - Data Collection Methods - Data Sources - primary, secondary and Big Data sources - Data Quality & Ethics - Tools and Technology for Data Collection.

UNIT-III: DATA ANALYSIS AND REPORTING (09 Periods)

Overview of Multivariate analysis - Experimental research, cause-effect relationship, and development of hypotheses- Measurement systems analysis, error propagation, and validity of experiments - Guidelines for writing abstracts, introductions, methodologies, results, and discussions - Writing Research Papers & proposals.

UNIT-IV: UNDERSTANDING INTELLECTUAL PROPERTY RIGHTS (09 periods)

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT-V: PATENTS (09 Periods)

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification - Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licenses, Licensing of related patents, patent agents, Registration of patent agents

Total Periods: 45

Textbooks:

T1. Stuart Melville and Wayne Goddard, Research Methodology: An introduction for Science & Engineering students, Juta and Company Ltd, 2004
T2. Catherine J. Holland, Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets, Entrepreneur Press, 2007.

References Books:

R1. Cooper Donald R, Schindler Pamela S and Sharma JK, Business Research Methods, Tata McGraw Hill Education, 2012, Eleventh Edition,
R2. David Hunt, Long Nguyen, Matthew Rodgers, Research Methodology: A Step-by-Step Guide for Beginners, Wiley, 2007.
R3. Deborah E. Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, Cengage, 2024, Sixth Edition,
R4. Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams, The Craft of Research, University of Chicago Press, 2024, Fifth Edition.
R5. Professional Programme Intellectual Property Rights, Law and practice, The Institute of Company Secretaries of India, Statutory body under an Act of parliament, September, 2013.

Web Resources:

1. Research Methodology and Data Analysis courses, Coursera / edX
2. Latest journals on research design and statistics, Springer Link & ScienceDirect
3. Free access to research papers Google Scholar
4. Open-access research methodology resources, NCBI Bookshelf
5. For fundamentals of hypothesis testing, regression, and ANOVA. Khan Academy (Statistics & Probability)

2599181	M.Tech., I-SEMESTER ENGLISH FOR RESEARCH PAPER WRITING (Common to AIDS, PS, Geo-Tech, RE, ES&VLSI) (AUDIT COURSE-I)	L	T	P	C
		2	0	0	2

COURSE OUTCOMES:

On successful completion of the course, student will be able to

CO1. Demonstrate proficiency in academic English by applying MAP principles, using clear, precise, and objective language, structuring coherent paragraphs, integrating references, and employing paraphrasing and appropriate tone in writing.

CO2. Exhibit critical reading skills to analyze academic texts, differentiate between article types, identify arguments and methodologies, evaluate findings, and make effective notes.

CO3. Apply advanced grammar and punctuation to construct clear, accurate, and complex sentences with proper voice, tense consistency, subject-verb agreement, and unambiguous references.

CO4. Revise and refine written work by editing for clarity, coherence, and grammar; proofread for accuracy; and apply effective strategies for professional correspondence and creative writing.

CO5. Demonstrate digital literacy by critically evaluating online content, using AI tools ethically in research writing, generating accurate citations, and practicing plagiarism-free writing with awareness of fair practices.

SYLLABUS:

UNIT-I: FUNDAMENTALS OF ACADEMIC ENGLISH (05 Periods)

Academic English - MAP (Message-Audience-Purpose) - Language Proficiency for Writing - Key Language Aspects - Clarity and Precision - Objectivity - Formal Tone - Integrating References - Word order - Sentences and Paragraphs - Link Words for Cohesion - Avoiding Redundancy / Repetition - Breaking up long sentences - Structuring Paragraphs - Paraphrasing Skills – Framing Title and Sub-headings

UNIT-II: READING SKILLS FOR RESEARCHERS (06 Periods)

Reading Academic Texts - Critical Reading Strategies - Skimming and Scanning - Primary Research Article vs. Review Article - Reading an Abstract - Analyzing Research Articles - Identifying Arguments - Classifying Methodologies - Evaluating Findings - Making Notes

UNIT-III: GRAMMAR REFINEMENT FOR RESEARCH WRITING (06 Periods)

Advanced Punctuation Usage - Grammar for Clarity - Complex Sentence Structures - Active-Passive Voice - Subject-Verb Agreement - Proper Use of Modifiers - Avoiding Ambiguous Pronoun References - Verb Tense Consistency - Conditional Sentences.

UNIT-IV: MASTERY IN REFINING WRITTEN CONTENT/EDITING SKILLS (07 Periods)

Effective Revisions - Restructuring Paragraph - Editing vs Proofreading, Editing for Clarity and Coherence - Rectifying Sentence Structure Issues - Proofreading for Grammatical Precision – Spellings - Tips for Correspondence with Editors - Critical and Creative Phases of Writing.

UNIT-V: TECHNOLOGY AND LANGUAGE FOR RESEARCH (06 Periods)

Digital Literacy and Critical Evaluation of Online Content - Technology and Role of AI in Research Writing – Assistance in Generating Citations and References - Plagiarism and Ethical Considerations – Tools and Awareness – Fair Practices

Total Periods: 30

Textbooks:

T1. Routledge, Bailey. S. Academic Writing: A Handbook for International Students. London and New York: 2015.

T2. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.

Reference books:

R1. Craswell, G., Writing for Academic Success, Sage Publications, 2004.

R2. Peter Elbow, Writing With Power, E-book, Oxford University Press, 2007

R3. Oshima, A. & Hogue, A., Writing Academic English, Addison-Wesley, New York, 2005

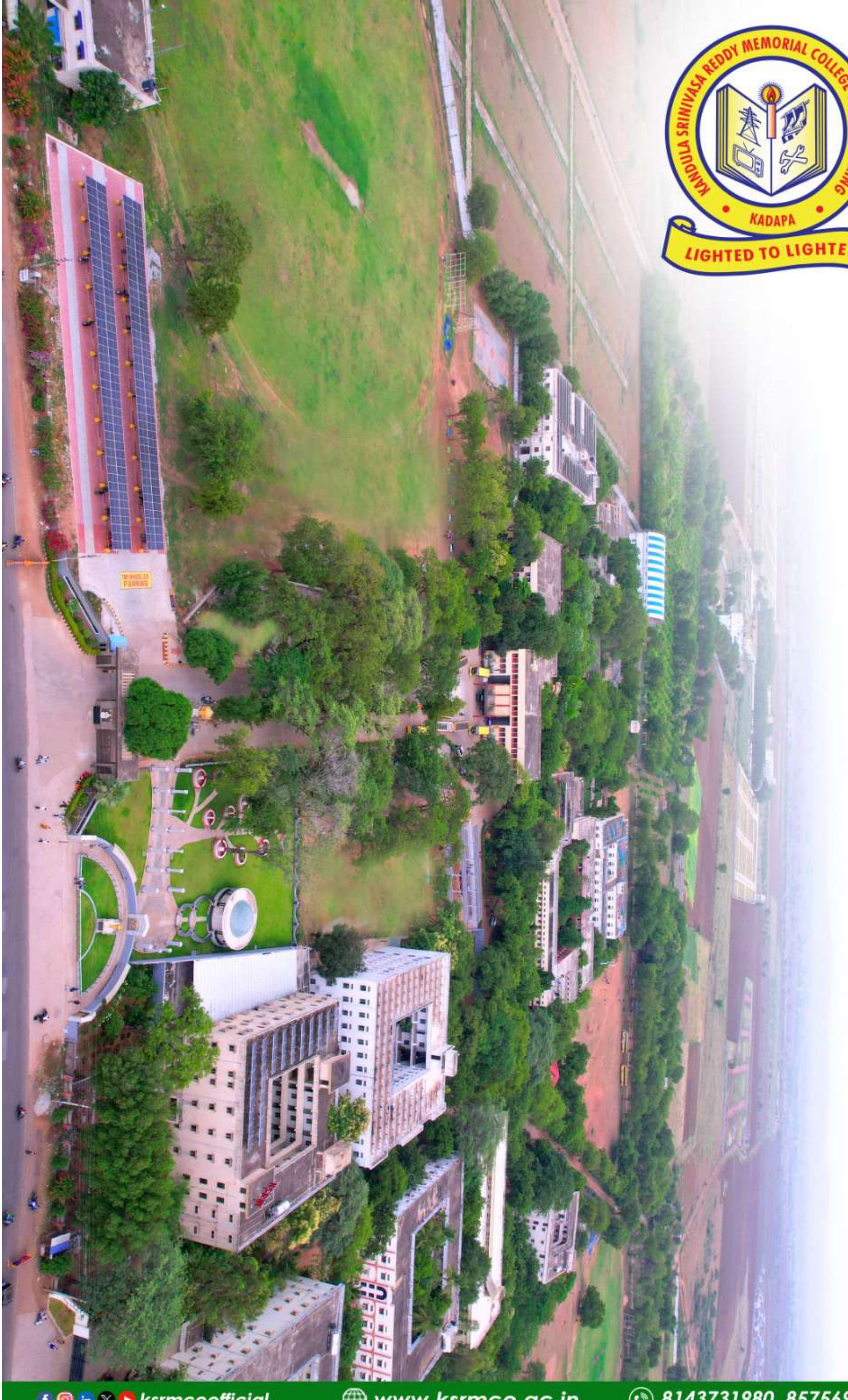
R4. Swales, J. & C. Feak, Academic Writing for Graduate Students: Essential Skills and Tasks, Michigan University Press, 2012.

R5. Goldbort R., Writing for Science, Yale University Press (available on Google Books), 2006

R6. Day R., How to Write and Publish a Scientific Paper, Cambridge University Press, 2006

Web Resources:

1. https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-ge04/
2. https://onlinecourses.swayam2.ac.in/ntr24_ed15/preview
3. "Writing in the Sciences" – Stanford University (MOOC on Coursera) https://www.coursera.org/learn/sciwrite
4. Academic Phrasebank – University of Manchester http://www.phrasebank.manchester.ac.uk
5. OWL (Online Writing Lab) – Purdue University, https://owl.purdue.edu *(Resources on APA/MLA formats, grammar, structure, paraphrasing)*
6. Zotero or Mendeley (Reference Management Tools) – Useful for managing citations and sources.



KANDULA SRINIVASA REDDY MEMORIAL COLLEGE OF ENGINEERING

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