ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

M.Tech (PEED)

FOR
MASTER OF TECHNOLOGY TWO YEAR POST GRADUATE COURSE
(Applicable for the batches admitted from 2015-2016)

ANURAG GROUP OF INSTITUTIONS
(AUTONOMOUS)
Venkatapur, Ghatkesar, Hyderabad – 500 088
Applicable for the students of M. Tech. (Regular) programme from the Academic Year 2015-16 and onwards

The M. Tech. Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

1. **ELIGIBILITY FOR ADMISSIONS**

   Admission to the above programme shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.

   Admissions shall be made on the basis of merit/rank obtained by the candidates at the qualifying Entrance Test conducted by the University or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Govt. from time to time.

**AWARD OF M. Tech. DEGREE**

   A student shall be declared eligible for the award of the M. Tech. Degree, if he pursues a course of study in not less than two and not more than four academic years, failing which he shall forfeit his seat in M. Tech. programme.

   The student shall register for all 88 credits and secure all the 88 credits.

   The minimum instruction days in each semester are 90.

3.0 **COURSES OF STUDY**

   The following specializations are offered at present for the M. Tech. programme of study.

   1. CAD/CAM
   2. Computer Networks and Information Security
   3. Computer Science
   4. Computer Science and Engineering
   5. Construction Management
   6. Electrical Power Systems
   7. Electronics and Communication Engineering
   8. Embedded Systems
   9. Machine Design
   10. Power Electronics and Electrical Drives
   11. Software Engineering
   12. Structural Engineering
   13. VLSI System Design
   14. Wireless and Mobile Communication
Course Registration

4.1 A ‘Faculty Advisor or Counselor’ shall be assigned to each student, who will advise him on the Post Graduate Programme (PGP), its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

4.2 Academic Section of the College invites ‘Registration Forms’ from students with in 15 days from the commencement of class work through ‘ON-LINE SUBMISSIONS’, ensuring ‘DATE and TIME Stamping’. The ON-LINE Registration Requests for any ‘CURRENT SEMESTER’ shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the ‘PRECEDING SEMESTER’.

4.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the ‘WRITTEN APPROVAL’ from his Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor and the Student).

4.4 If the Student submits ambiguous choices or multiple options or erroneous entries - during ON-LINE Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration.

4.5 Subject/ Course Options exercised through ON-LINE Registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices will also not be considered. However, if the Subject/ Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

1. ATTENDANCE

The programmes are offered on a unit basis with each subject being considered a unit.

Attendance in all classes (Lectures/Laboratories etc.) is compulsory. The minimum required attendance in each theory / Laboratory etc. is 75% including the days of attendance in sports, games, NCC and NSS activities for appearing for the End Semester examination. A student shall not be permitted to appear for the Semester End Examinations (SEE) if attendance is less than 75%.

Condonation of shortage of attendance in each subject up to 10% (65% and above and below75%)in each semester shall be granted by the College Academic Committee on genuine medical grounds and valid reasons on representation by the candidate with supporting evidence.
Shortage of Attendance below 65% in each subject shall not be condoned.

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

A prescribed fees shall be payable towards condonation of shortage of attendance.

A candidate shall get minimum required attendance at least in three (3) theory subjects in the present semester to get promoted to the next semester. In order to qualify for the award of the M.Tech Degree, The candidate shall complete all the academic requirements of the subjects, as per the course structure.

A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present Semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission in to the same class.

6 EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks for theory and 100 marks for practicals, on the basis of Internal Evaluation and End Semester Examination.

6.1 For the theory subjects 60 marks shall be awarded for the performance in the Semester End Examination and 40 marks shall be awarded for Continuous Internal Evaluation (CIE). The Continuous Internal Evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted, one in the middle of the Semester and the other, immediately after the completion of Semester instructions. Each mid-term examination shall be conducted for a total duration of 120 minutes with Part A as compulsory question (10 marks) consisting of 5 sub-questions carrying 2 marks each, and Part B with 3 questions to be answered out of 5 questions, each question carrying 10 marks. The details of the Question Paper pattern for End Examination (Theory) are given below:

- The Semester End Examination will be conducted for 60 marks. It consists of two parts. i). Part-A for 20 marks, ii). Part-B for 40 marks.

- Part-A is a compulsory question consisting of 5 questions, one from each unit and carries 4 marks each.

- Part-B to be answered 5 questions carrying 8 marks each. There will be two questions from each unit and only one should be answered.

6.2 For practical subjects, 60 marks shall be awarded for performance in the Semester End
Examinations and 40 marks shall be awarded for day-to-day performance as Internal Marks.

6.3 The practical end semester examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed by the Principal from the panel of examiners recommended by Chairman, Board of Studies in respective Branches.

6.4 There shall be two seminar presentations during I year I semester and II semester. For seminar, 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 Departmental Academic Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each Seminar there will be only internal evaluation of 50 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. If he fails to fulfill minimum marks, he has to reappear during the supplementary examinations.

6.5 There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce is intended to assess the students’ understanding of various subjects he has studied during the M. Tech. course of study. The Head of the Department shall be associated with the conduct of the Comprehensive Viva-Voce through a Committee. The Committee consisting of Head of the Department, one senior faculty member and an external examiner. The external examiner shall be appointed by the Principal from the panel of 3 examiners recommended by Chairman, Board of Studies in respective Branches. There are no internal marks for the Comprehensive Viva-Voce and evaluates for maximum of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. If he fails to fulfill minimum marks, he has to reappear during the supplementary examinations.

6.6 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 Semester End Examination and a minimum aggregate of 50% of the total marks in the Semester End Examination and Continuous Internal Evaluation taken together.

6.7 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 6.6) he has to reappear for the Semester End Examination in that subject.

6.8 A candidate shall be given one chance to re-register for the subjects if the internal marks secured by a candidate is less than 50% and failed in that subject for maximum of two subjects and should register within four weeks of commencement of the class work. In such a case, the candidate must re-register for the subjects and secure the required minimum attendance. The candidate’s attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the Semester End Examination in those subjects. In the event of the student taking another chance, his Continuous Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stands cancelled.

6.9 In case the candidate secures less than the required attendance in any subject, he shall not be permitted to write the Semester End Examination in that subject. He shall re-register for the subject when next offered.
1. **Examinations and Assessment - The Grading System**

7.1 Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practicals, or Seminar, or Project, etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 6 above, and a corresponding Letter Grade shall be given.

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

<table>
<thead>
<tr>
<th>% of Marks Secured (Class Intervals)</th>
<th>Letter Grade (UGC Guidelines)</th>
<th>Grade Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>80% and above</td>
<td>O (Outstanding)</td>
<td>10</td>
</tr>
<tr>
<td>(≥ 80%, ≤ 100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 80% but not less than 70%</td>
<td>A+ (Excellent)</td>
<td>9</td>
</tr>
<tr>
<td>(≥ 70%, &lt; 80%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 70% but not less than 60%</td>
<td>A (Very Good)</td>
<td>8</td>
</tr>
<tr>
<td>(≥ 60%, &lt; 70%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 60% but not less than 55%</td>
<td>B+ (Good)</td>
<td>7</td>
</tr>
<tr>
<td>(≥ 55%, &lt; 60%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 55% but not less than 50%</td>
<td>B (Above Average)</td>
<td>6</td>
</tr>
<tr>
<td>(≥ 50%, &lt; 55%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 50%</td>
<td>F (Fail)</td>
<td>0</td>
</tr>
<tr>
<td>(≤ 50%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>Ab</td>
<td>0</td>
</tr>
</tbody>
</table>

7.3 A student obtaining F Grade in any Subject shall be considered ‘failed’ and is required to reappear as ‘Supplementary Candidate’ in the Semester End Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subjects will remain the same as those he obtained earlier.

7.4 A student not appeared for examination then ‘Ab’ Grade will be allocated in any Subject shall be considered ‘failed’ and will be required to reappear as ‘Supplementary Candidate’ in the Semester End Examination (SEE), as and when offered.

7.5 A Letter Grade does not imply any specific Marks percentage and it will be the range of marks percentage.
7.6 In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of ‘Grade Improvement’ or ‘SGPA/ CGPA Improvement’.

7.7 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course. The corresponding ‘Credit Points’ (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

\[ \text{Credit Points (CP)} = \text{Grade Point (GP)} \times \text{Credits} \quad \text{.... For a Course} \]

7.8 The Student passes the Subject/ Course only when he gets \( \text{GP} \geq 6 \) (B Grade or above).

7.9 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (\( \Sigma \text{CP} \)) secured from ALL Subjects/ Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

\[
\text{SGPA} = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} C_i} \quad \text{For each Semester},
\]

where ‘i’ is the Subject indicator index (takes into account all Subjects in a Semester), ‘N’ is the no. of Subjects ‘REGISTERED’ for the Semester (as specifically required and listed under the Course Structure of the parent Department), C is the no. of Credits allotted to the ith Subject, and G represents the Grade Points (GP) corresponding to the Letter Grade awarded for that ith Subject.

7.10 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

\[
\text{CGPA} = \frac{\sum_{j=1}^{M} C_j G_j}{\sum_{j=1}^{M} C_j} \quad \text{... for all S Semesters registered (i.e., upto and inclusive of S Semesters, } S \geq 2),
\]

where ‘M’ is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has ‘REGISTERED’ from the 1st Semester onwards up to and inclusive of the Semester S (obviously M > N), ‘j’ is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C is the no. of Credits allotted to the jth Subject, and G represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

7.11 For Calculations listed in Item 7.6 – 7.10, performance in failed Subjects/ Courses
1. **EVALUATION OF PROJECT/DISSERTATION WORK**

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

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

8.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical.

8.3 After satisfying 8.2, a candidate has to submit, in consultation with his Project Supervisor, the title, objective and plan of action of his project work to the PRC for approval. Only after obtaining the approval of the PRC the student can initiate the Project work.

8.4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

8.5 A candidate shall submit his project status report in two stages at least with a gap of 3 months between them.

8.6 The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.

8.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College/School/Institute.

8.8 For Project work Review I in II Year I Sem. there is an internal marks of 50, the evaluation should be done by the PRC for 25 marks and Supervisor will evaluate for 25 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain. A candidate has to secure a minimum of 50% of marks to be declared successful for Project Work Review I. If he fails to fulfill minimum marks, he has to reappear as per the recommendations of PRC.

8.9 For Project work Review II in II Year II Sem. there is an internal marks of 50, the evaluation should be done by the PRC for 25 marks and Supervisor will evaluate for 25 marks. The PRC will examine the overall progress of the Project Work and
decide the Project is eligible for final submission or not. A candidate has to secure a minimum of 50% of marks to be declared successful for Project Work Review II. If he fails to fulfill minimum marks, he has to reappear as per the recommendations of PRC.

8.10 For Project Evaluation (Viva Voce) in II Year II Sem. there is an external marks of 150 and the same evaluated by the External examiner appointed by the Institution. The candidate has to secure minimum of 50% marks in Project Evaluation (Viva-Voce) examination.

8.11 If he fails to fulfill as specified in 8.10, he will reappear for the Viva-Voce examination only after three months. In the reappeared examination also, fails to fulfill, he will not be eligible for the award of the degree.

8.12 The thesis shall be adjudicated by one examiner selected by the Institution. For this, Chairmen, BOS of the respective departments shall submit a panel of 3 examiners, who are eminent in that field with the help of the concerned guide and senior faculty of the department.

8.13 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis. If the report of the examiner is un favourable again, the thesis shall be summarily rejected.

8.14 If the report of the examiner is favourable, Project Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis.

8.15 The Head of the Department shall coordinate and make arrangements for the conduct of Project Viva-Voce examination.

9. AWARD OF DEGREE AND CLASS

9.1 A Student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (PGP), and secures the required number of 88 Credits (with CGPA ≥ 6.0), shall be declared to have ‘QUALIFIED’ for the award of the M.Tech. Degree in the chosen Branch of Engineering and Technology with specialization as he admitted.

9.2 Award of Class

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

<table>
<thead>
<tr>
<th>Class Awarded</th>
<th>CGPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Class with Distinction</td>
<td>≥ 7.75</td>
</tr>
<tr>
<td>First Class</td>
<td>6.75 ≤ CGPA &lt; 7.75</td>
</tr>
<tr>
<td>Second Class</td>
<td>6.00 ≤ CGPA &lt; 6.75</td>
</tr>
</tbody>
</table>

9.3 A student with final CGPA (at the end of the PGP) < 6.00 will not be eligible for
the Award of Degree.

10. **WITHHOLDING OF RESULTS**

If the student has not paid the dues, if any, to the institution or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

11. **TRANSITORY REGULATIONS**

11.1 If any candidate is detained due to shortage of attendance in one or more subjects, they are eligible for re-registration to maximum of two earlier or equivalent subjects at a time as and when offered.

11.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per R15 Academic Regulations.

12 **GENERAL**

12.1 **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 or tutorial) or two hours of practical work/field work per week.

12.2 **Credit Point:** It is the product of grade point and number of credits for a course.

12.3 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”.

12.4 The academic regulation should be read as a whole for the purpose of any interpretation.

12.5 In the case of any doubt or ambiguity in the interpretation of the above rules, the Decision of the Academic Council is final.

12.6 The Academic Council may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Academic Council.
## MALPRACTICES RULES

### DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

<table>
<thead>
<tr>
<th>Nature of Malpractices/Improper conduct</th>
<th>Punishment</th>
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<tbody>
<tr>
<td>If the candidate:</td>
<td></td>
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<tr>
<td>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)</td>
<td>Expulsion from the examination hall and cancellation of the performance in that subject only</td>
</tr>
<tr>
<td>(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.</td>
<td>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.</td>
</tr>
<tr>
<td>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.</td>
<td>Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidates 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 controller of examinations, AGI.</td>
</tr>
<tr>
<td>3. Impersonates any other candidate in connection with the examination.</td>
<td>The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the</td>
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<tr>
<td><strong>Subjects of the examination (including practical’s and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester 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.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>4.</strong> 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.</td>
<td>Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidates 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 semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.</td>
</tr>
<tr>
<td><strong>5.</strong> 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.</td>
<td>Cancellation of the performance in that subject.</td>
</tr>
<tr>
<td><strong>6.</strong> 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 office 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, they shall be expelled from examination halls and cancellation of their performance in that subjects 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. The candidates also are debarred and forfeit their seats. In case of outsiders. They will be handed over to the police and a police case is registered against them.</td>
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<tr>
<td><strong>examination hall</strong> 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.</td>
<td><strong>Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidates 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 semester examinations. The continuation of the course by the candidate is subject to the academic regulation in connection with forfeiture of seat.</strong></td>
</tr>
<tr>
<td><strong>7.</strong> Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.</td>
<td><strong>Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidates 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 semester examinations. The continuation of the course by the candidate is subject to the academic regulation in connection with forfeiture of seat.</strong></td>
</tr>
<tr>
<td><strong>8.</strong> Posses any lethal weapon or firearm in the examination hall.</td>
<td><strong>Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidates 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.</strong></td>
</tr>
</tbody>
</table>
| **9.** If student of the college, who is not a candidate for the particular examination or any person not connected with college indulges in any malpractice or improper conduct mentioned in clause 6 to 8 | **Student of the college’s expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidates 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 forfeiture the seat.**  

**Person(s) who do not belong to the College will be handed over to police and, a police case**
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>Comes in a drunken condition to the examination hall.</td>
<td>Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidates 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.</td>
</tr>
<tr>
<td>11.</td>
<td>Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.</td>
<td>Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of the semester/year examinations.</td>
</tr>
<tr>
<td>12.</td>
<td>If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Malpractices committee, AGI for further action to award suitable punishment.</td>
<td></td>
</tr>
</tbody>
</table>
# ANURAG GROUP OF INSTITUTIONS
## (AUTONOMOUS)

## COURSE STRUCTURE

### I Year - I Semester

<table>
<thead>
<tr>
<th>Category</th>
<th>Course Title</th>
<th>Int. marks</th>
<th>Ext. marks</th>
<th>L</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Course I</td>
<td>Machine Modeling and Analysis</td>
<td>40</td>
<td>60</td>
<td>4</td>
<td>--</td>
<td>4</td>
</tr>
<tr>
<td>Core Course II</td>
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### I Year – II Semester

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### II Year - I Semester

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### II Year - II Semester

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MACHINE MODELLING AND ANALYSIS

UNIT-I:

UNIT-II:
Mathematical model of separately excited DC motor and DC Series motor in state variable form – Transfer function of the motor - Numerical problems.

UNIT-III:
Liner transformation – Phase transformation (a, b, c to α, β, o) – Active transformation (α, β, o to d, q).
Circuit model of a 3 phase Induction motor – Linear transformation - Phase Transformation – Transformation to a Reference frame – Two axis models for induction motor.

UNIT-IV:

UNIT-V:

TEXT BOOKS:

REFERENCES BOOK:
MODERN CONTROL THEORY

UNIT–I: MATHEMATICAL PRELIMINARIES

UNIT-II: STATE VARIABLE ANALYSIS

UNIT-III: NON LINEAR SYSTEMS

UNIT-IV: STABILITY ANALYSIS

UNIT-V: OPTIMAL CONTROL
TEXT BOOKS:

REFERENCES:
POWER ELECTRONIC CONTROL OF DC DRIVES

UNIT–I: SINGLE-PHASE CONTROLLED RECTIFIER FED DC MOTOR

Separately excited DC motors with rectified single –phase supply – single-phase semi converter and single phase full converter for continuous and discontinuous modes of operation – power and power factor.

UNIT–II: THREE-PHASE CONTROLLED RECTIFIER FED DC MOTOR

Three-phase semi converter and Three phase full converter for continuous and discontinuous modes of operation – power and power factor - Addition of Free wheeling diode – Three phase dual converter. Three phase controlled bridge rectifier with passive load impedance, resistive load and ideal supply – Highly inductive load and ideal supply for load side and supply side quantities, shunt capacitor compensation, three phase controlled bridge rectifier inverter.

UNIT–III: PHASE, CURRENT & SPEED CONTROLLED DC DRIVE


UNIT–IV: CHOPPER CONTROLLED DC MOTOR DRIVES


UNIT–V: SIMULATION OF DC MOTOR DRIVES

Dynamic simulations of the speed controlled DC motor drives – Speed feedback speed controller – command current generator – current controller.
REFERENCES:

UNIT-I: INTRODUCTION
General consideration, Power Handling Capabilities of HVDC Lines Basic Conversion principles, static converter configuration.

UNIT-II: STATIC POWER CONVERTERS
3-pulse, 6-pulse, and 12-pulse converters, converter station and Terminal equipment, commutation process, Rectifier and inverter operation, equivalent circuit for converter – special features of converter transformers. Harmonics in HVDC Systems, Harmonic elimination, AC and DC filters.

UNIT-III: CONTROL OF HVDC CONVERTERS AND SYSTEMS
Constant current, constant extinction angle and constant ignition angle control- Individual phase control and equidistant firing angle control - DC power flow control. Interaction between HV AC and DC systems – Voltage interaction - Harmonic instability problems and DC power modulation.

UNIT-IV: MTDC SYSTEMS & OVER VOLTAGES
Series, parallel and series-parallel systems - their operation and control.
Over voltages due to disturbances on DC side, over voltages due to DC and AC side line faults.

UNIT-V: CONVERTER FAULTS & PROTECTION
Converter faults -Over current protection - Valve group - DC line protection - Over voltage protection of converters -Surge arresters.

REFERENCE BOOKS:
ANURAG GROUP OF INSTITUTIONS
(AUTONOMOUS)


OPERATIONS RESEARCH
(Elective – I)

UNIT-I:
Linear Programming Problem: Formulation – Graphical method - Simplex method –
Artificial variable techniques – Big-M tune –phase methods
Duality theorem – Dual simplex method – Sensitivity analysis - effect of changes in cost
coefficients, Constraint constants, Addition/Deletion of variables & constraints.

UNIT-II:
Transportation problem – formulation – Initial basic feasible solution methods –
Northwest, Least cost & Vogels methods, MODI optimization - Unbalanced &
degeneracy treatment - Assignment problem – Formulation – Hungarian method –
Variants of assignment problems, Sequencing problems – Flow shop sequencing – n jobs
2 machines sequencing - n jobs 3 machines sequencing – Job-shop sequencing – 2 jobs m
machines sequencing – Graphical methods.

UNIT-III:
Game Theory - Introduction - Terminology – Saddle point games - with out Saddle point
games - 2 2 games, analytical method - 2 n and m 2 games – graphical method –
dominance principle. Dynamic programming – Bellman’s principle of optimality – short
route – capital investment – inventory allocation.

UNIT-IV:
Non linear optimization – Single variable optimization problem – Unimodal function -
Elimination methods – Fibinocci & Golden reaction methods - Interpolation methods -
Quadratic & cubic interpolation method. Multi variable optimization problem – Direct

UNIT-V:
Geometric programming – Polynomial – Arithmetic – Seametric inequality –
Unconstrained G.P – Constraint G.P with type constraint.
Simulation: Definition – Types- steps- Simulation of simple electrical systems –
Advantages and Disadvantages

TEXT BOOKS:

REFERENCES:

1. “Optimization techniques: Theory & Practice” - M.C.Joshi & K.M. More
   Ugalya - Narosa Publications.
3. “Simulation Modelling & Analysis” - Law & Kelton – TMH.
4. “Optimization Concepts and Applications in Engineering” - A.D. Belegundu ,
   J.R. Chandrupata - Pearson Education – Asia.
UNIT- I: OVERVIEW OF EMBEDDED SYSTEM

UNIT-II: PROCESSOR & MEMORY ORGANIZATION
Structural units in a processor, Processor selection, Memory devices, Memory selection, Memory Allocation & Map, Interfacing.

UNIT-III: DEVICES, DEVICE DRIVES & BUSES FOR DEVICE NETWORKS
I/O devices, Timer & Counter devices, Serial Communication, Communication between devices using different buses - Device drives, Parallel and serial port device drives in a system, Interrupt servicing mechanism, context and periods for context switching, Deadline and Interrupt Latency.

UNIT-IV: PROGRAMMING & PROGRAM MODELING CONCEPTS
Program elements, Modeling Processes for Software Analysis, Programming Models, Modeling of Multiprocessor Systems, Software algorithm Concepts, design, implementation, testing, validating, debugging, Management and maintenance, Necessity of RTOS.

UNIT-V: HARDWARE AND SOFTWARE CO-DESIGN
Embedded system design and co design issues in software development, design cycle in development phase for Embedded System, Use of ICE & Software tools for development of ES, Issues in embedded system design.

REFERENCE BOOKS:
UNIT-I: OVERVIEW OF ARCHITECTURE & MICROCONTROLLER RESOURCES
Architecture of a microcontroller – Microcontroller resources – Resources in advanced
and next generation microcontrollers – 8051 microcontroller – Internal and External
memories – Counters and Timers – Synchronous serial-cum asynchronous serial
communication - Interrupts.

UNIT-II: 8051- MICROCONTROLLERS INSTRUCTION SET
Basic assembly language programming – Data transfer instructions – Data and Bit-
manipulation instructions – Arithmetic instructions – Instructions for Logical operations
on the test among the Registers, Internal RAM, and SFRs – Program flow control
instructions – Interrupt control flow.

UNIT-III: REAL TIME CONTROL
INTERRUPTS: Interrupt handling structure of an MCU – Interrupt Latency and
Interrupt deadline
– Multiple sources of the interrupts – Non-maskable interrupt sources – Enabling or
disabling of the sources – Polling to determine the interrupt source and assignment of the
priorities among them – Interrupt structure in Intel 8051.
TIMERS: Programmable Timers in the MCU’s – Free running counter and real time
control – Interrupt interval and density constraints.

UNIT-IV: SYSTEMS DESIGN
DIGITAL AND ANALOG INTERFACING METHODS:
Switch, Keypad and Keyboard interfacings – LED and Array of LEDs – Keyboard-cum-
Display controller (8279) – Alphanumeric Devices – Display Systems and its interfaces –
Printer interfaces – Programmable instruments interface using IEEE 488 Bus –
Interfacing with the Flash Memory – Interfaces – Interfacing to High Power Devices –
Analog input interfacing – Analog output interfacing – Optical motor shaft encoders –
Industrial control – Industrial process control system – Prototype MCU based Measuring
instruments – Robotics and Embedded control – Digital Signal Processing and digital
filters.

UNIT-V: REAL TIME OPERATING SYSTEM FOR MICROCONTROLLERS:
Real Time operating system – RTOS of Keil (RTX51) – Use of RTOS in Design –
Software development tools for Microcontrollers.
16-BIT MICROCONTROLLERS: Hardware – Memory map in Intel 80196 family
MCU system – IO ports – Programmable Timers and High-speed outputs and input
captures – Interrupts – instructions.
ARM 32 Bit MCUs: Introduction to 16/32 Bit processors – ARM architecture and
organization – ARM / Thumb programming model – ARM / Thumb instruction set –
Development-tools.
TEXT BOOKS:

REFERENCE BOOKS:
PROGRAMMABLE LOGIC CONTROLLERS AND THEIR APPLICATIONS
(Elective–II)

Unit I: PLC Basics
PLC system - I/O modules and interfacing - CPU processor - Programming Equipment - Programming formats - Construction of PLC ladder diagrams - Devices connected to I/O modules.

Unit II: PLC Programming
Input instructions - Outputs - Operational procedures - Programming examples using contacts and coils - Drill press operation.

Digital Logic Gates
Programming in the Boolean algebra system - Conversion examples - Ladder Diagrams for process control - Ladder diagrams & sequence listings - Ladder diagram construction and flowchart for spray process system.

Unit III: PLC Registers
Characteristics of Registers - Module addressing - Holding registers - Input Registers - Output Registers.

PLC Functions
Timer functions & Industrial applications - Counters - Counter function - Industrial applications - Arithmetic functions - Number comparison functions - Number conversion functions

Unit IV: Data Handling Functions

Unit V: Analog PLC Operation
Analog modules& systems - Analog signal processing - Multi bit Data Processing - Analog output application Examples - PID principles - Position indicator with PID control - PID Modules - PID tuning - PID functions.

REFERENCE BOOKS:

ANURAG GROUP OF INSTITUTIONS
(AUTONOMOUS)


SPECIAL MACHINES
(Elective–II)

UNIT-I: SPECIAL TYPES OF D.C MACHINES-I
Series booster-Shunt booster-Non-reversible boost-Reversible booster


UNIT–II: STEPPER MOTORS
Introduction-synchronous inductor ( or hybrid stepper motor ), Hybrid stepping motor, construction, principles of operation, energization with two phase at a time- essential conditions for the satisfactory operation of a 2-phase hybrid step motor - very slow - speed synchronous motor for servo control-different configurations for switching the phase windings-control circuits for stepping motors-an open-loop controller for a 2-phase stepping motor.

UNIT-III: VARIABLE RELUCTANCE STEPPING MOTORS
Variable reluctance ( VR ) Stepping motors, single-stack VR step motors, Multiple stack VR motors-Open-loop control of 3-phase VR step motor-closed-Loop control of step motor, discriminator ( or rotor position sensor ) transilator, major loop-characteristics of step motor in open-loop drive – comparison between open-loop position control with step motor and a position control servo using a conventional ( dc or ac ) servo motor-Suitability and areas of application of stepping motors-5- phase hybrid stepping motor - single phase - stepping motor, the construction, operating principle torque developed in the motor.

SWITCHED RELUCTANCE MOTOR: Introduction – improvements in the design of conventional reluctance motors- Some distinctive differences between SR and conventional reluctance motors-principle of operation of SRM- Some design aspects of stator and rotor pole arcs, design of stator and rotor and pole arcs in SR motor-determination of L(θ)-θ profile - power converter for SR motor-A numerical example – Rotor sensing mechanism and logic control, drive and power circuits, position sensing of rotor with Hall problems-derivation of torque expression, general linear case.

UNIT–IV: PERMANENT MAGNET MATERIALS AND MOTORS
Introduction, Hysteresis loops and recoil line- stator frames (pole and yoke - part) of conventional PM dc Motors, Equivalent circuit of a PM-Development of Electronically commutated dc motor from conventional dc motor.

BRUSHLESS DC MOTOR: Types of construction – principle of operation of BLDM-sensing and switching logic scheme, sensing logic controller, lockout pulses –drive and power circuits, Base drive circuits, power converter circuit-Theoretical analysis and performance prediction, modeling and magnet circuit d-q analysis of BLDM -transient analysis formulation in terms of flux linkages as state variables-Approximate solution for
current and torque under steady state – Theory of BLDM as variable speed synchronous motor (assuming sinusoidal flux distribution) - Methods of reducing Torque Pulsations, 180 degrees pole arc and 120 degree current sheet.

UNIT-V: LINEAR INDUCTION MOTOR
Development of a double sided LIM from rotary type IM - A schematic of LIM drive for electric traction development of one sided LIM with back iron-field analysis of a DSLIM fundamental assumptions.

TEXT BOOKS:
1. “Special electrical machines” - K. Venkataratnam - University press.
POWER ELECTRONIC CONVERTERS-I
(Open Elective - I)

UNIT-I: MODERN POWER SEMICONDUCTOR DEVICES
Modern power semiconductor devices – MOS turn Off Thyristor (MTO) – Emitter Turn off Thyristor (ETO) – Intergrated Gate-Commutated thyristor (IGCTs) – MOS-controlled thyristors (MCTs) – Static Induction circuit – comparison of their features.

UNIT-II: SINGLE PHASE AC VOLTAGE CONTROLLERS

UNIT-III: THREE-PHASE AC VOLTAGE CONTROLLERS & CYCLO- CONVERTERS

UNIT-IV: SINGLE-PHASE & THREE-PHASE CONVERTERS

UNIT-V: D.C. TO D.C. CONVERTERS
TEXT BOOKS:

REFERENCE BOOKS:
Unit I:

Unit II:

Unit III:
Classification of engineering systems: series, parallel and series-parallel systems- Expressions for the reliability of the basic configurations. Reliability evaluation of Non-series-parallel configurations: Decomposition, Path based and cutest based methods, Deduction of the Paths and cutsets from Event tree.

Unit IV:

UNIT-V:
Approximate system Reliability analysis of Series systems, parallel systems with two and more than two components, Network reduction techniques. Minimal cutest/failure mode approach.

TEXT BOOKS:
REFERENCES:
ANURAG GROUP OF INSTITUTIONS
(AUTONOMOUS)


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SMART GRID TECHNOLOGIES
(Open Elective – I)

Prerequisite: Electrical and Electronic Instrumentation

UNIT–I:
Smart Grid to Evolve A Perfect Power System: Introduction- Overview of the perfect power system configurations- Device level power system- Building integrated power systems- Distributed power systems- Fully integrated power system- Nodes of innovation.

UNIT–II:
DC Distribution and Smart Grid: AC Vs DC sources-Benefits of and drives of DC power delivery systems - Powering equipment and appliances with DC-Data centers and information technology loads - Future neighborhood-Potential future work and research.
Intelligrid Architecture for the Smartgrid: Introduction- Launching intelligrid - Intelligrid today - Smart grid vision based on the intelligrid architecture- Barriers and enabling technologies.

UNIT–III:
Dynamic Energy Systems Concept: Smart energy efficient end use devices-Smart distributed energy resources - Advanced whole building control systems- Integrated communications architecture - Energy management-Role of technology in demand response- Current limitations to dynamic energy management-Distributed energy resources-Overview of a dynamic energy management-Key characteristics of smart devices- Key characteristics of advanced whole building control systems - Key characteristics of dynamic energy management system.

UNIT–IV:
Energy Port as Part of the Smart Grid: Concept of energy - Port, generic features of the energy port.

UNIT–V:
Efficient Electric End – Use Technology Alternatives: Existing technologies – lighting – Space conditioning - Indoor air quality - Domestic water heating - hyper efficient appliances – Ductless residential heat pumps and air conditioners - Variable refrigerant flow air conditioning-Heat pump water heating - Hyper efficient residential appliances - Data center energy efficiency- LED street and area lighting - Industrial motors and drives
- Equipment retrofit and replacement - Process heating - Cogeneration, Thermal energy storage - Industrial energy management programs – Manufacturing process-Electro-technologies, Residential, Commercial and industrial sectors.

**TEXT BOOKS:**

**REFERENCES:**
POWER CONVERTERS LAB

1. Speed Measurement and closed loop control using PMDC motor.

2. Thyristorised drive for PMDC Motor with speed measurement and closed Loop control.

3. IGBT used single 4 quadrant chopper drive for PMDC motor with speed measurement and closed loop control.

4. Thyristorised drive for 1Hp DC motor with closed loop control.

5. 3-Phase input, thyristorised drive, 3 Hp DC motor with closed loop control.

6. 3-Phase input IGBT, 4 quadrant chopper drive for DC motor with closed Loop control equipment.

7. Cyclo-converter based AC Induction motor control equipment.

8. Speed control of 3 phase wound rotor Induction motor.


10. Single phase half wave controlled converter with inductive load.
POWER ELECTRONIC CONVERTERS-II

UNIT-I: PWM INVERTERS (SINGLE-PHASE & THREE-PHASE)

UNIT-II: RESONANT PULSE INVERTERS

UNIT-III: MULTILEVEL INVERTERS
UNIT-IV: DC POWER SUPPLIES

UNIT-V: AC POWER SUPPLIES

TEXT BOOKS:
UNIT-I: INTRODUCTION

UNIT-II: STATOR SIDE CONTROL OF INDUCTION MOTOR DRIVES

UNIT-III: ROTOR SIDE CONTROL OF INDUCTION DRIVES

UNIT–IV: CONTROL OF PMSM DRIVES
Synchronous motor and its characteristics –PMSM dynamic model – vector control - Control strategies – Constant torque angle control – Unity power factor control – Constant mutual flux linkage control.

UNIT–V: VARIABLE RELUCTANCE MOTOR DRIVE
Variable Reluctance motor drives – Torque production in the variable reluctance motor - Drive characteristics and control principles – Current control variable reluctance motor servo drive.
**BRUSHLESS DC MOTOR DRIVES:** Three phase full wave Brushless dc motor – Sinusoidal type of Brushless dc motor- current controlled Brushless dc motor Servo drive.

REFERENCES:
3. “Power Electronics and Control of AC Motors” - MD Murthy and FG Turn Bull
   Pergman Press (For Chapters II, III, V ) 1st edition
4. “Power Electronics and AC Drives” - BK Bose – Prentice Hall Eagle wood diffs -
   New Jersey ( for chapters I, II, IV ) - 1st edition
   (for chapter II )
8. “Power Electronics and Motor Drives Advances and Trends” - Bimal Bose -
   Elesvier.
ANURAG GROUP OF INSTITUTIONS
(AUTONOMOUS)

M. Tech (PEED) – I Year – II Sem.

L P C
4 0 4

NEURAL NETWORK AND FUZZY SYSTEMS

UNIT-I:

UNIT-II:
Multilayer networks, architectures and modeling, BP algorithm, radial basis functions. Unsupervised learning-Winner all learning, out star learning, Counter propagation networks, self organizing networks-Kohonen networks.

UNIT-III:

UNIT-IV:

UNIT-V:
Application to load forecasting, load flow, fault detection-unit commitments, LF control – economic dispatch, Neuro-Fuzzy controllers.

TEXTBOOK:

REFERENCE BOOKS:
UNIT – I: INTRODUCTION
Block Diagram of typical control system- advantages of sampling in control systems – examples of discrete data and digital systems – data conversion and quantization – sample and hold devices – D/A and A/D conversion – sampling theorem – reconstruction of sampled signals –ZOH.

Z-transform: Definition and evaluation of Z-transforms – mapping between s-plane and z-plane – inverse z-plane transform – theorems of the Z-transforms – limitations of z-transforms – pulse transfer function – pulse transfer function of ZOH – relation between G(s) and G(z) – signal flow graph method applied to digital systems.

UNIT- II: STATE SPACE ANALYSIS


UNIT- III: TIME DOMAIN ANALYSIS
Comparison of time response of continuous data and digital control systems-correlation between time response and root locus j the s-plane and z-plane – effect of pole-zero configuration in the z-plane upon the maximum overshoot and peak time of transient response – Root loci for digital control systems – steady state error analysis of digital control systems – Nyquist plot – Bode plot- G.M and P.M.

UNIT- IV: DESIGN

UNIT-V: DIGITAL STATE OBSERVER
Design of Full order and reduced order observers - Design by max. principle: Discrete Euler language equation- Discrete maximum principle.
TEXT BOOKS:

REFERENCE BOOKS:
UNIT-I: INTRODUCTION

Introduction of the Power Quality (PQ) problems, Terms used in PQ: Voltage Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring.

UNIT-II: LONG & SHORT INTERRUPTIONS


Short interruptions: definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping – voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

UNIT III: 1-PHASE & 3-PHASE VOLTAGE SAG CHARACTERIZATION

Voltage sag – definition, causes of voltage sag, voltage sag magnitude, and monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, and voltage sag duration.

Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags.

UNIT-IV: POWER QUALITY CONSIDERATIONS IN INDUSTRIAL POWER SYSTEMS

Voltage sag – equipment behavior of Power electronic loads, induction motors, synchronous motors, computers, consumer electronics, adjustable speed AC drives and its operation. Mitigation of AC Drives, adjustable speed DC drives and its operation, mitigation methods of DC drives.

UNIT-V: MITIGATION OF INTERRUPTIONS & VOLTAGE SAGS

Overview of mitigation methods – from fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, improving equipment immunity, different events and mitigation methods.
System equipment interface – voltage source converter, series voltage controller, shunt controller, combined shunt and series controller.

**Power Quality and EMC Standards:**
Introduction to standardization, IEC Electromagnetic compatibility standards, European voltage characteristics standards, PQ surveys.

**REFERENCE BOOK:**

UNIT-I: DIGITAL FILTER STRUCTURES


UNIT-II: DIGITAL FILTER DESIGN


UNIT-III: DSP ALGORITHM IMPLEMENTATION

Computation of the discrete Fourier transform- Number representation – Arithmetic operations – handling of overflow – Tunable digital filters – function approximation.

UNIT-IV: ANALYSIS OF FINITE WORD LENGTH EFFECTS


UNIT-V: POWER SPECTRUM ESTIMATION

REFERENCE BOOKS:

ANURAG GROUP OF INSTITUTIONS  
(AUTONOMOUS)

M. Tech (PEED) – I Year – II Sem.

DYNAMICS OF ELECTRICAL MACHINES  
(Elective-IV)

UNIT-I: BASIC MACHINE THEORY

UNIT-II: ELECTRODYNAMICAL EQUATION & THEIR SOLUTIONS
Spring and Plunger system - Rotational motion – mutually coupled coils – Lagrange’s equation – Application of Lagrange’s equation solution of Electro dynamical equations.

UNIT-III: DYNAMICS OF DC MACHINES

UNIT-IV: INDUCTION MACHINE DYNAMICS

UNIT-V: SYNCHRONOUS MACHINE DYNAMICS

REFERENCE BOOKS:

HIGH-FREQUENCY MAGNETIC COMPONENTS
(Elective-IV)

UNIT-I:

UNIT-II:

UNIT-III:
UNIT-IV:


**Design of Inductors:** Introduction, Restrictions on Inductors, Window Utilization Factor, Temperature Rise of Inductors, Mean Turn Length of Inductors, Area Product Method, AC Inductor Design, Inductor Design for Buck Converter in CCM method, Inductor Design for Buck Converter in DCM method.

UNIT-V:


TEXT BOOKS:


REFERENCES:

4. “Electro-dynamic Magnetic Suspension” - Thompson
5. “Introduction to modeling of transformers and coupled inductors” - Witulski Beattie
6. "Effects of eddy currents in transformer windings" - P.L. Dowell
7. “Eddy current losses in transformer windings” - Dixon
9. “Windings” - Texas Instruments
10. “Magnetic core characteristics” - Ferroxcube Instruments

"3f3 ferrite datasheet" - Ferroxcube Instruments

“Ferrite selection guide” - Ferroxcube Instruments

UNIT-I:
Photo voltaic power generation, spectral distribution of energy in solar radiation, solar cell configurations, voltage developed by solar cell, photo current and load current, practical solar cell performance, commercial photo voltaic systems, test specifications for PV systems, applications of super conducting materials in electrical equipment systems.

UNIT-II:
Principles of MHD power generation, ideal MHD generator performance, practical MHD generator, MHD technology.
Wind Energy conversion: Power from wind, properties of air and wind, types of wind Turbines, operating characteristics.

UNIT-III:
Tides and tidal power stations, modes of operation, tidal project examples, turbines and generators for tidal power generation.
Wave energy conversion: properties of waves and power content, vertex motion of Waves, device applications. Types of ocean thermal energy conversion systems Application of OTEC systems examples,

UNIT-IV:
Miscellaneous energy conversion systems: coal gasification and liquefaction, biomass conversion, geothermal energy, thermo electric energy conversion, principles of EMF generation, description of fuel cells, Co-generation and energy storage, combined cycle co-generation, energy storage.
Global energy position and environmental effects: energy units, global energy position.

UNIT-V:
Types of fuel cells, H2-O2 Fuel cells, Application of fuel cells – Batteries, Description of batteries, Battery application for large power. Environmental effects of energy conversion systems, pollution from coal and preventive measures steam stations and pollution, pollution free energy systems.

TEXT BOOKS:

FLEXIBLE AC TRANSMISSION SYSTEMS (FACTS)  
(Open Elective-II)

UNIT-I: FACTS CONCEPTS

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.

UNIT-II: VOLTAGE SOURCE CONVERTERS

Single phase and three phase full wave bridge converters - Transformer connections for 12 pulse, 24 pulse and 48 pulse operation.  

UNIT-III: STATIC SHUNT COMPENSATION


UNIT-IV: SVC AND STATCOM

The regulation and slope transfer function - Dynamic performance -Transient stability enhancement and power oscillation damping -Operating point control -Summary of compensator control.

UNIT-V: STATIC SERIES COMPENSATORS

Concept of series capacitive compensation - Improvement of transient stability - Power oscillation damping -Functional requirements- GTO thyristor controlled Series Capacitor (GSC) -Thyristor Switched Series Capacitor(TSSC) - Thyristor Controlled Series Capacitor(TCSC) -Control schemes for GSC, TSSC,TCSC and SSSC.

TEXT BOOKS:

UNIT – I
Basic Converter Circuits:
Buck Regulator, Buck- Boost Regulator, Boost Regulator, Cuk Converters and Resonant Converters. Choice of switching frequency.

UNIT – II
Isolated SMPS:

UNIT – III
Control Aspects
PWM Controllers, Isolation in feedback loop, Power Supplies with multiple output. Stability analysis using Bode Diagrams.

UNIT – IV
Design Considerations
Selection of output filter capacitor, Selection of energy storage inductor, Design of High Frequency Inductor and High frequency Transformer, Selection of switches. Snubber circuit design, Design of driver circuits.

UNIT – V
Electro Magnetic Interference (EMI)
EMI Filter Components, Conducted EMI suppression, Radiated EMI suppression, Measurement.
Protection
Over current protection, Over voltage protection, Inrush current protection.
Thermal Model

TEXT BOOKS:
5) Course Material on Switched Mode Power Conversion, V. Ramanarayanan.

REFERENCE BOOKS:
1) Krein P.T .Elements of Power Electronics., Oxford University Press
2) M.H.Rashid, Power Electronics. Prentice-Hall of India
INTELLIGENT CONTROL
(Open Elective-II)

Unit-I
Introduction and motivation. Approaches to intelligent control. Architecture for intelligent control.
Symbolic reasoning system, rule-based systems, the AI approach. Knowledge representation. Expert systems.

Unit-II
Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feedforward Multilayer Perceptron. Learning and Training the neural network. Data Processing: Scaling, Fourier transformation, principal-component analysis.

Unit-III

Unit-IV
Genetic Algorithm: Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters. Solution of typical control problems using genetic algorithm. Concept on some other search techniques like tabu search and ant-colony search techniques for solving optimization problems.

Unit-V
Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning.

TEXT BOOKS:

REFERENCES:
3. N.K. Bose and P.Liang, Neural Network Fundamentals with Graphs, Algorithms and
ELECTRICAL SYSTEMS SIMULATION LAB

1. Write program and simulate dynamical system of following models:
   a) I/O Model
   b) State variable model
   Also identify time domain specifications of each.
2. Obtain frequency response of a given system by using various methods:
   (a) General method of finding the frequency domain specifications.
   (b) Polar plot
   (c) Bode plot
   Also obtain the Gain margin and Phase margin.
3. Determine stability of a given dynamical system using following methods.
   a) Root locus
   b) Bode plot
   c) Nyquist plot
   d) Liapunov stability criteria
4. Transform a given dynamical system from I/O model to state variable model and vice versa.
5. Obtain model matrix of a given system, obtain it’s diagonal form if exists or obtain Jordon Canonical form of system.
6. Write a program and implement linear quadratic regulator
7. Design a compensator for a given systems for required specifications.
8. Conduct a power flow study on a given power system using Newton- Raphson iterative method.
10. Conduct a power flow study on a given power system using Gauss-Seidel iterative method.
11. Develop a program to solve Swing Equation.
12. Develop a Simulink model for a single area load frequency problem and simulate the same.
13. Develop a Simulink model for a two-area load frequency problem and simulate the same.
14. Design a PID controller for two-area power system and simulate the same.
15. PSPICE Simulation of Single phase full converter using RL and E loads.
16. PSPICE Simulation of Three phase full converter using RL and E loads.
17. PSPICE Simulation of Single phase AC Voltage controller using RL load.
18. PSPICE Simulation of Three phase inverter with PWM controller.
19. PSPICE Simulation of resonant pulse commutation circuit.
20. PSPICE Simulation of impulse commutation circuit.
PART A:
2. Three phase full converter using RL and E loads.
4. Three-phase inverter with PWM controller.
5. DC-DC Converters.

PART B:
8. Write program and simulate dynamical system of following models:
   i. I/O Model  ii. State variable model
   Also identify time domain specifications of each.
9. Obtain frequency response of a given system by using various methods:
   i. General method of finding the frequency domain specifications.
   ii. Polar plot
   iii. Bode plot
   iv. Also obtain the Gain margin and Phase margin.
10. Determine stability of a given dynamical system using following methods.
   i. Root locus
   ii. Bode plot
   iii. Nyquist plot
   iv. Liapunov stability criteria
11. Transform a given dynamical system from I/O model to state variable model and vice versa.
12. Design a compensator for a given systems for required specifications.
13. Design a PID controller based on Bode plot.
14. Develop a program to solve Swing Equation.

Notes: Use the suitable software for each simulation. Any ten experiments, Six from PART A and Four from PART B, can be selected from the above list.