SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES

(AUTONOMOUS)

Dr. Visweswaraiah Road, (Bangalore-Tirupathi Bye-pass Road),
Murukambattu, Chittoor – 517127, Andhra Pradesh, India

M.Tech
Course Structures and Syllabi
Under R20 Regulations

(Applicable for 2020-2021 Regular Students)

POWER ELECRTRONICS
Department of Electrical and Electronics Engineering

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.

(AUTONOMOUS-NAAC ACCREDITED)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MTECH –POWER ELECRTRONICS

INSTITUTE VISION

To emerge as a Centre of Excellence for Learning and Research in the domains of engineering, computing and management.

INSTITUTE MISSION

IM1: Provide congenial academic ambience with state -of -art of resources for learning and research.

IM2: Ignite the students to acquire self-reliance in the latest technologies.

IM3: Unleash and encourage the innate potential and creativity of students.

IM4: Inculcate confidence to face and experience new challenges.

IM5: Foster enterprising spirit among students.

IM6: Work collaboratively with technical Institutes / Universities / Industries of National and International repute.

DEPARTMENT VISION

To impart innovative technical education with global standards, inculcate high pattern of discipline, thereby cultivating Electrical and Electronics Engineering students technologically prominent and ethically strong to meet the challenges of the society.

DEPARTMENT MISSION

DM1: Provide congenial academic ambience with necessary infrastructure and learning resources.

DM 2: Inculcate confidence to face and experience new challenges from industry and society.

DM 3: Ignite the students to acquire self-reliance in State-of-the-Art Technologies

DM 4: Foster Enterprising spirit among students

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

PEO1: To apply the technical knowledge in the field of Electrical and Electronics Engineering to pursue higher studies or in their professional career.

PEO2: To demonstrate technical knowledge to analyze, design, develop, optimize, and implement complex electrical systems.

PEO3: To gain multidisciplinary knowledge through projects and industrial training, providing a sustainable competitive edge in R&D and meeting industrial needs in the field of Electrical and Electronics Engineering.

PROGRAM SPECIFIC OUTCOMES (PSO'S)

PSO1: Ability to design, analyze and solve problems in the field of Electrical & Electronics Engineering by applying knowledge acquired from Electrical Power Systems, Electrical Machines, Control Systems, Power Electronics and Field theory

PSO2: To excel in current technologies, important to electrical engineering, as well as probable future technological advances & contribute actively to the field by participating in professional societies, attending technical events, doing research, pursuing higher education.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

Computer Science and Engineering Graduates will be able to:

PO1 - Engineering knowledge: Apply the knowledge of mathematics, science, engineering Fundamentals, and an engineering specialization for the solution of complex engineering problems.

PO2 - Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 - Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

PO4 - Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 - Modern tool usage: Ability to design and develop hardware and software in emerging technology environments like cloud computing embedded products, real-time systems, Internet of Things, Big Data etc.

PO6- Engineering and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7- Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8- Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 - Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 - Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 - Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 - Life-long learning: Basic knowledge in hardware/software methods and tools for solving real-life and R&D problems with an orientation to lifelong learning.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.

(AUTONOMOUS-NAAC ACCREDITED)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ACADEMIC REGULATIONS

(SITAMS - R20)

(M.Tech Regular-Full Time Two year degree program)

(For the batches admitted from the Academic Year 2020-2021)

(CHOISE BASED CREDIT SYSTEM)

1. ELIGIBILITY FOR ADMISSION

Admission of the M.Tech program shall be made subjects to the eligibility qualifications and Specialization prescribed by the University for each Program from time to time. Admission shall be made either on the basis of Merit/ Rank Obtained by the Qualifying candidates in PGCET or otherwise specified whichever is relevant.

2. AWARD OF M.Tech. DEGREE

- A student will be declared eligible for the award of the M.Tech. Degree if he/she fulfils the following academic regulations:
- Pursues a course of study for not less than two academic years and in not more than four academic years.
- Registers for 68 credits and secure all 68 credits.

Semester	Course Particulars					Number of Credits
	Theory Courses	Practical Courses	MOOC / Open Elective	Audit Course	Project Work	
I-I	15	4	-	1	-	20
I-II	18	4	-	-	-	22
II-I	-	-	2	-	10	12
IV-I	-	-	-	-	14	14
Total Credits Allotted						**68**

3. ACADEMIC REQUIREMENTS

Students, who fail to fulfill 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.

4. CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Engineering Science (ES), Professional Core (PC), Core Elective (CE), Open Elective (OE), Project Work (PW), and Mandatory Audit Course (MAC).

5. CONTACT PERIODS

Depending on the complexity and volume of the course, the number of contact hours per week will be assigned. Each Theory and Laboratory course carries credits based on the number of hours / week as follows.

- Contact classes (Theory): 1 credit per lecture hour per week.
- Laboratory Hours (Practical): 1 credit for 2 Practical hours, per week.
- Project Work: 1 credit for 2 hours of project work per week

6. SUPPLEMENTARY EXAMINATIONS

The student eligible to appear the supplementary external examinations if he was absent for it or failed in it or not registered.

7. DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in each semester shall be evaluated subject–wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition, project work shall be evaluated for100 marks.

- For theory subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examination.
- For practical subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End- Examination.

Internal Examinations

For theory subjects, during the semester, there shall be two mid-term examinations. Each mid-term examination consists of subjective paper for 30 marks with duration of 1hour 50 minutes. However 10 marks are awarded for a Technical Seminar presentation (Preferably case study topics on the particular course). Technical Seminar is presented from the students before term end examinations (preferably before practical examination) for every theory subjects.

Note 1: The theory subjective paper shall contain 3 questions of equal Weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 30 marks; any fraction shall be rounded off to the next higher mark.

Note 2: If the student is absent for the internal examination, no re-exam or make up shall be conducted and internal marks for that examination shall be considered as zero.

Note 3: First midterm examination shall be conducted for 50% of the syllabus and second midterm examination shall be conducted for the remaining 50% of the syllabus.

Note 4: Final Internal marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 20 Marks obtained in Second mid: 20

Internal Marks: (20x0.8) + (20x0.2) = 20

Final internal marks= Internal Marks+ Technical Seminar Presentation

Note 5: If the student is absent for any one midterm examination, the final internal marks shall be arrived at by considering 80% Weightage to the marks secured by the student in the appeared examination and zero to the other.

Note 6: For practical subjects there shall be a 40 sessional marks (20 marks allotted for one internal practical examination to be conducted before the last working day and 20 marks for Day-to- day work in the laboratory shall be evaluated by the concerned laboratory teacher based on the regularity / record / viva-voce) and end examination shall be for 60 marks.

End Examinations

End examinations (Theory courses)

End examination of theory subjects shall have the following pattern:

i. End examination shall be for 60 marks.
ii. There shall be either-or type questions for 12 marks each. Student shall answer any one of them.
iii. Each of these questions covers one unit of the syllabus.

End examinations (Practical courses)

End examination of practical course shall have the following pattern:

i. End examination shall be for 60 marks.
ii. The end examination shall be conducted by the concerned laboratory teacher and senior expert in the same subject of the department.

8. MASSIVE ONLINE OPEN COURSE'S (MOOC'S) AND OPEN ELECTIVE

i. The CBCS, also called as Open Electives (OEs) will be implemented in the college. The CBCS provides choice for students to select from the prescribed courses. In which students can take courses of their choice, learn at their own pace and adopt an interdisciplinary approach to learning.

ii. The college in line with the developments in Learning Management Systems (LMS) intends to encourage the students to do online courses in MOOCs, offered nationally / internationally. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self- learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion of the course from the MOOCs providers.

iii. Institution intends to encourage the students to do one MOOC in II year I Semester of the M.Tech. Programme. The respective departments shall give a list of standard MOOCs providers among NPTEL, edx, Udacity, Coursera, or any other standard providers, whose credentials are endorsed by the HOD. Each department shall appoint Coordinators / Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.

iv. A student shall choose an online open elective course, except his / her program of study from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.

v. Students may be permitted to register one online course (which is provided with certificate) in II year I semester and they should produce the course completion certificate of that course to the controller of Examination to become eligible for fulfillment of the degree before the end of II year II semester of their study.

vi. If, the student is unable to complete the certified MOOC within the stipulated period of time and if the candidate selected the MOOC has discontinued from the standard MOOC provider, the college has to conduct the equivalent examination (on the same MOOC syllabus) internally with the approval from the head of the department on the request of students along with separate examination fee.

9. CORE ELECTIVES

Students have to choose core electives (CE-I and CE-II) in I year I semester and core electives (CE-III and IV) in I year II semester, from the list of core electives courses given. However, the students may opt for core elective subjects offered in the related area.

10. PROJECT WORK

i. The project work for M.Tech. Programmes consist of Phase–I and Phase–II.

ii. The Phase–I is to be undertaken during II year I semester and Phase–II, which is a continuation of Phase–I is to be undertaken during II year II semester.

iii. If Candidates not completing Phase-I of project work successfully, the candidates can undertake Phase-I again in the subsequent semester. In such cases the candidates can enroll for Phase-II, only after successful completion of Phase-I.

iv. Project work shall be carried out under the supervision of a "senior teacher" in the Department. In this context "senior teacher" means the faculty member possessing (a) PG degree with a minimum of 5 years experience in teaching or (b) Ph.D. degree.

v. A candidate may, however, in certain cases, be permitted to work on projects in an Industrial/Research Organization, on the recommendations of the Head of the Department Concerned. In such cases, the Project work shall be jointly supervised by a supervisor of the department and an expert, as a joint supervisor from the organization and the student shall be instructed to meet the supervisor periodically and to attend the review committee meetings for evaluating the progress.

vi. The Project work (Phase II) shall be pursued for a minimum of 16 weeks during the final semester.

vii. The deadline for submission of final Project Report is 60 calendar days from the last working day of the semester in which project / thesis / dissertation is done. However, the Phase-I of the Project work shall be submitted within a maximum period of 30 calendar days from the last working day of the semester as per the academic calendar published by the Institution.

11. EVALUATION OF PROJECT WORK

- The evaluation of Project Work for Phase-I & Phase-II shall be done independently in the respective semesters and marks shall be allotted as per the weightages given in Clause 11.1.
- There shall be three internal assessments during the Semester by a review committee.
- The Student shall make presentation on the progress made before the Committee.
- The Head of the Department shall constitute the review committee.
- The total marks obtained in the three assessments shall be converted to 40 marks and rounded to the nearest integer (as per the Table given below).
- Project Work for Phase-I, there will be a Viva-voce Examination during End of the Semester conducted by a Committee consisting of the supervisor, two internal examiners (Preferably one Senior Teacher and Head of the Department).
- Project Work for Phase-II, there will be a Viva-voce Examination during End Semester Examinations conducted by a Committee consisting of the supervisor, one internal examiner and one external examiner.
- The internal examiner and the external examiner shall be appointed by the Principal / Chief Examiner.
- As per the guidelines given the project report must be prepared and submitted to the Head of the department before the Viva-Voce Examination.
- The distribution of marks for the internal assessment and End semester examination is given below:

Project-Work:

<table>
<tr><th colspan="7">Phase I</th></tr>
<tr><th colspan="3">Internal Assessment (40 Marks)</th><th colspan="4">End Semester Examination (60 Marks)</th></tr>
<tr><td rowspan="2">Review - I</td><td rowspan="2">Review - II</td><td rowspan="2">Review - III</td><td colspan="4">Project Work Phase I Viva – Voce
(60 Marks)</td></tr>
<tr><td>Thesis Submission (Project Review Committee)</td><td>Supervisor Examiner</td><td>Internal Examiner 1</td><td>Internal Examiner 2</td></tr>
<tr><td>10</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td></tr>
<tr><th colspan="7">Phase II</th></tr>
<tr><th colspan="3">Internal Assessment (40 Marks)</th><th colspan="4">End Semester Examination (60 Marks)</th></tr>
<tr><td rowspan="2">Review - I</td><td rowspan="2">Review - II</td><td rowspan="2">Review - III</td><td colspan="4">Project Work Phase II Viva – Voce
(60 Marks)</td></tr>
<tr><td>Thesis Submission (External Examiner)</td><td>Supervisor Examiner</td><td>Internal Examiner</td><td>External Examiner</td></tr>
<tr><td>10</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td></tr>
</table>

- In case of Industrial Project, Students are encouraged to go to Industrial Internship for at least 2-3 months and should be organized by the Head of the Department for every student.
- At the end of the Industrial Project, the candidate shall submit a certificate from the organization where he/she has undergone industrial training and also a brief report. The evaluation for 100 marks will be carried out internally based on this report and a Viva-Voce Examination will be conducted by a Departmental Committee constituted by the Head of the Institution.
- If the candidate fails to obtain 50% of the internal assessment marks in the Phase–I and Phase–II / final project viva-voce, he/she will not be permitted to submit the report for that particular semester and has to re-enroll for the same in the subsequent semester.

- At the end of the Phase – II Project Work, the candidate has to incorporate the plagiarism report in their thesis and it should be less than 30% (Excluding the references).
- The candidate has to publish at-least one research paper on their project topic in either Scopus indexed or Web of Science indexed journal (UGC listed journal) and details of the acceptance of the paper(s) / published paper(s) should be incorporated in the thesis.
- If a candidate fails to submit the project report on or before the specified deadline, he/she is deemed to have failed in the Project Work and shall re-enroll for the same in a subsequent semester. This applies to both Phase–I and Phase–II project work.
- If a candidate fails in the end semester examinations of Phase–I, he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. If he / she fails in the End semester examination of Phase–II of Project work, he/she shall resubmit the Project Report within 60 days from the date of declaration of the results. The resubmission of a project report and subsequent viva-voce examination will be considered as reappearance with payment of exam fee. For this purpose the same Internal and External examiners shall evaluate the resubmitted report.
- A copy of the approved Project Report after the successful completion of viva-voce examinations shall be kept in the library of the Institution.

12. ATTENDANCE REQUIREMENTS

- A student shall be eligible to appear for University examinations if he / she acquires minimum of 75% of attendance in aggregate of all the subjects in a semester.
- Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- 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.

- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
- A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester when offered next.
- A stipulated fee shall be payable towards Condonation of shortage of attendance to the College.

13. COURSE PATTERN

- The entire course of study is for two academic years. All years shall be on semester pattern. A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination whenever it offered.
- When a student is detained due to shortage of attendance he may be re-admitted when the semester is offered after fulfillment of academic regulations. In such case, he / she shall be in the academic regulations into which he / she is readmitted.

14. WITH-HOLDING THE RESULT

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

15. GRADING

- After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.
- Table – Conversion into Grades and Grade Points assigned

Range in which the Marks In the Subject Fall	**Grade**	**Grade Points** Assigned
≥ 90	S	10
80 ≥ 89	A	9
70 ≥ 79	B	8
60 ≥ 69	C	7
50 ≥ 59	D	6
< 50	F (Fail)	0
Absent	Abs (Absent)	0

- A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.
- For non credit courses “Pass” shall be indicated instead of the letter ‘P’ and this will not be counted for the computation of SGPA/CGPA.

16. 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.

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

  Where, Ci is the number of credits of the ith subject and Gi is the grade point scored by the student in the ith course.

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

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

  Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.
- Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- SGPA will be given to those who cleared all the subjects in that semester
- 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.

17. AWARD OF CLASS

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

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$

18. TRANSITORY REGULATIONS

- Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfillment of academic regulations

19. MINIMUM INSTRUCTION DAYS

- The minimum instruction days including exams for each semester shall be 90 days.

20. REVALUATION

- A candidate can apply for revaluation of his / her end examination answer paper in a theory courses. The examination section shall issue a notification inviting applications for the revaluation after publishing the results. The application forms can be obtained from the examination section. A candidate can apply for revaluation of answer scripts in not more than 5 subjects at a time.
- No revaluation for comprehensive Examination, practical and project work.

21. CONDUCT AND DISCIPLINE

i. Students shall conduct themselves within and outside the precincts of the Institute in a manner befitting the students of an Institute of National importance

ii. As per the order of the Hon'ble Supreme Court of India, ragging in any form is banned: acts of ragging will be considered as gross indiscipline and will be severely dealt with.

iii. The following additional acts of omission and /or commission by the students within or outside the precincts of the college shall constitute gross violation of code of conduct and are liable to invoke disciplinary measures

a. Ragging
b. Lack of courtesy and decorum: indecent behavior anywhere within or outside the campus.
c. Willful damages or stealthy removal of any property /belongings of the Institute / Hostel or of fellow students
d. Possession, consumption of distribution of alcoholic drinks or any kind of hallucinogenic drugs
e. Mutilation or unauthorized possession of library books
f. Hacking in computer systems
g. Furnishing false statements to the disciplinary committee, or willfully withholding information relevant to an enquiry

h. Organizing or participation in any activity that has potential for driving fellow students along lines of religion caste batch of admission hostel or any other unhealthy criterion.
i. Resorting to noisy and unseemly behavior, disturbing studies of fellow students
j. Physical or mental harassment of fresher through physical contact or oral abuse
k. Adoption of unfair means in the examination
l. Organizing or participating in any group activity except purely academic and scientific Programmers in company with others in or outside campus without prior permission of the Principal
m. Disturbing in drunken state or otherwise an incident in academic or students function or any other public event.
n. Not obeying traffic rules in campus not following safety practices or causing potential danger to oneself or other persons in any way.
o. Any other act or gross indiscipline

iv. Commensurate with the gravity of the offence the punishment may be reprimand fine and expulsion from the hostel debarment from an examination rustication for a specified period or even outright expulsion from the College

v. The reprimanding Authority for an offence committed by students in the Hostel and in the Department or the classroom shall be respectively, the managers of the Hostels and the Head of the concerned Department

vi. In all the cases of offence committed by students in jurisdictions outside the purview of clause (21.v) the Principal shall be the Authority to reprimand them.

vii. All Major acts of indiscipline involving punishment other than mere reprimand shall be considered and decided by the Principal Students Disciplinary Committee appointed by the Principal.

viii. All other cases of Indiscipline of Students like adoption of unfair means in the examinations shall be reported to the Vice-Principal for taking appropriate action and deciding on the punishment to be levied.

ix. In all the cases of punishment levied on the students for any offence committed the aggrieved party shall have the right to appeal to the Principal who shall constitute appropriate Committees to review the case.

22. TRANSFER DETAILS

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

23. GENERAL

- The academic regulations should be read as a whole for purpose of any interpretation. Malpractices rules- nature and punishments are appended.
- Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
- 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.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.

(AUTONOMOUS-NAAC ACCREDITED)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M.Tech: Power Electronic -Course Structures and Syllabi under R20 Regulations

I M.Tech. I Sem.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MPE011	Analysis of Power Electronic Converters	PC	3	-	-	3	40	60	100
2.	20MPE012	Power Electronic Control of DC drives	PC	3	-	-	3	40	60	100
3.	20MPE013	Control system design for power Electronics	PC	3	-	-	3	40	60	100
4.	20MMAC11	Research Methodology and IPR	PC	2	-	-	1	40	60	100
5.	20MPE014	Core Elective – I	CE	3	-	-	3	40	60	100
6.	20MPE015	Core Elective - II	CE	3	-	-	3	40	60	100
7.	20MPE016	Power Converters Lab -I	PC	-	-	4	2	40	60	100
8.	20MPE017	Power Electronic Control Circuits Lab	PC	-	-	4	2	40	60	100
Contact Hours per week				17	-	8	-	-	-	-
Total Hours per week				25			-	-	-	-
Total credits							20	-	-	-
Total Marks								360	480	800

I M.Tech. II Sem.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MPE021	Modern Rectifiers And Resonant Converters.	PC	3	-	-	3	40	60	100
2.	20MPE022	Power Electronic Control Of AC drives.	PC	3	-	-	3	40	60	100
3.	20MPE023	Digital Control Of Power Electronics And Drives.	PC	3	-	-	3	40	60	100
4.	20MPE024	Modern Power Electronics	CE	3	-	-	3	40	60	100
5.	20MPE025	Core Elective – III	CE	3	-	-	3	40	60	100
6.	20MPE026	Core Elective - IV	CE	3	-	-	3	40	60	100
7.	20MPE027	Power Converters Lab -II	PC	-	-	4	2	40	60	100
8.	20MPE028	Electrical Systems Simulation Lab	PC	-	-	4	2	40	60	100
Contact Hours per week							-	-	-	-
Total Hours per week							-	-	-	-
Total credits							22	-	-	-
Total Marks								360	480	800

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.

(AUTONOMOUS-NAAC ACCREDITED)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II M.Tech. I Sem.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	MOOC	Open Elective	OE	-	-	-	2	-	-	P
2.	20MPE031	Project Work(Phase-I) / Industrial Project*	PW	-	-	-	10	40	60	100
Contact Hours per week							-	-	-	-
Total Hours per week							-	-	-	-
Total credits							12	-	-	-
Total Marks								40	60	100

II M.Tech. II Sem.

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MPE041	Project Work (Phase-II) / Industrial Project*	PW	-	-	-	14	40	60	100
Contact Hours per week							-	-	-	-
Total Hours per week							-	-	-	-
Total credits							14	-	-	-
Total Marks								40	60	100

Students are encouraged to go to Industrial Internship for at least 2-3 months.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.

(AUTONOMOUS-NAAC ACCREDITED)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

I M.Tech. I Sem. (Core Elective – I)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MPE014A	Excitation of Synchronous Machines And Their Control	CE	3	-	-	3	40	60	100
2.	20MPE014B	FPGA Based digital system design	CE	3	-	-	3	40	60	100
3.	20MPE014C	Neural Network And Fuzzy Systems	CE	3	-	-	3	40	60	100
4.	20MPE014D	Power Quality Improvements	CE	3	-	-	3	40	60	100

I M.Tech. I Sem. (Core Elective – II)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MPE015A	Application Of Power Electronics In Smart Grid	CE	3	-	-	3	40	60	100
2.	20MPE015B	Solar Energy Conversion Systems	CE	3	-	-	3	40	60	100
3.	20MPE015C	Solid State Lighting And Control	CE	3	-	-	3	40	60	100
4.	20MPE015D	Digital Controller Application In Power Converters	CE	3	-	-	3	40	60	100

I M.Tech. II Sem. (Core Elective – III)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MPE025A	Advanced Power Semiconductor Devices And Protection	CE	3	-	-	3	40	60	100
2.	20MPE025B	Energy Auditing, Conservation and Management.	CE	3	-	-	3	40	60	100
3.	20MPE025C	Optimal Control Theory	CE	3	-	-	3	40	60	100
4.	20MPE025D	Programmable Logic Controllers	CE	3	-	-	3	40	60	100

I M.Tech. II Sem. (Core Elective – IV)

S.No	Subject Code	Subject	Subject Category	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P/D	C	I	E	Total
1.	20MPE026A	Power Electronics Applications to Power Systems	CE	3	-	-	3	40	60	100
2.	20MPE026B	Advanced Drives And Control	CE	3	-	-	3	40	60	100
3.	20MPE026C	Intelligent Control Techniques	CE	3	-	-	3	40	60	100
4.	20MPE026D	Introduction To Embedded Systems	CE	3	-	-	3	40	60	100

SUMMARY OF CREDIT ALLOCATION

S.NO	Subject Area	Credits As Per Semester				Total Credits	Percentage -wise Credit Distribution
		I-I	I-II	II-I	II-II		
1.	PC	13	16	-	-	29	42.65
2.	CE	6	6	-	-	12	17.65
3.	OE	-	-	2	-	2	3.00
4.	PW	-	-	10	14	24	35.30
5.	MAC	1	0	-	-	1	1.50
Total		**20**	**22**	**12**	**14**	**68**	**100**

Note: PC – Professional Core; CE - Core Elective; OE - Open Elective; PW - Project Work; MAC – Mandatory Audit Course.

M.TECH I-I SEM (PE)	ANALYSIS OF POWER ELECTRONIC	L	T	P	C
SUB CODE: 20MPE011	CONVERTERS	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To learn about ac voltage controllers.
2. To impart knowledge on cyclo converters and dual converters.
3. To analyze three phase converters.
4. To design D.C. to D.C converters.
5. To impart knowledge on using pulse width modulated inverters.

UNIT-I AC VOLTAGE CONTROLLERS (9)

Single Phase AC Voltage Controllers with resistive - resistive-inductive and resistive-inductive-induced emf loads-ac voltage controller's with PWM control-Effects of source and load inductances –synchronous tap changers –Application- numerical problems. Three Phase AC Voltage controllers-Analysis of Controllers with star and delta connected resistive - resistive – inductive loads-Effects of source and load inductances–Application- numerical problems.

UNIT-II CYCLOCONVERTERS AND DUAL CONVERTERS (9)

Single phase to single phase cyclo converters –analysis of midpoint and bridge configurations-three phase to three phase cyclo converters-analysis of Midpoint and bridge configurations-Limitations-Advantages-Applications-numerical problems Single phase cycloconverters- Half controlled and fully controlled Converters – Evaluation of input power factor and harmonic factor-Continuous and Discontinuous load current-Single phase dual converters-Power factor improvements-Extinction angle control-symmetrical angle control- PWM single phase sinusoidal PWM-Single phase series converters-–Application- numerical problems

UNIT-III THREE PHASE CONVERTERS (9)

Three Phase Converters- Half controlled and fully controlled Converters – Evaluation of input power factor and harmonic factor-Continuous and Discontinuous load current-three phase dual converters-Power factor improvements-three phase PWM-twelve pulse converters–Application-numerical problems

UNIT-IV D.C. TO D.C CONVERTERS (9)

Analysis of step-down and step up dc to dc converters with resistive and resistive –inductive loads-Switched mode regulators- Analysis of Buck regulators-Boost Regulators-Buck-Boost Regulators-Cuk Regulators- Condition for continuous inductor and capacitor voltage-Comparison of regulators-Multi output boost regulators –advantages –Application- numerical problems

UNIT –V PULSE WIDTH MODULATED INVERTERS (9)

Principle of operation- Performance parameters- Single Phase bridge Inverters-Evaluation of output voltage and current with resistive - inductive and capacitive loads-Voltage control of single phase inverters – Single PWM-Multiple PWM-Sinusoidal PWM-modified PWM-phase

displacement control-Advanced Modulation techniques for improved performance - Trapezoidal - staircase - stepped - harmonic injection and delta modulation – Advantage-– Application- numerical problems. Three Phase inverters-analysis of 180 degree condition of output voltage and current with resistive -inductive loads-analysis of 120 degree conduction-Voltage control of three phase inverters-sinusoidal PWM-third harmonic PWM-60 degree PWM –space vector modulation- comparison of PWM techniques-Space vector modulation-Comparison of PWM techniques- harmonic reduction –current source inverters-Variable dc link inverter –boost inverters- buck and boost inverter – inverter circuit design – Advantage-–Application- numerical problems

TOTAL: 45 HOURS

TEXT BOOKS:

1. Power Electronics-Md.H.Rashid –Pearson Education 3rd Edition - 2004

REFERENCE BOOKS:

2. Power Electronics- N.Mohan - Tore.M.Undeland - W.P.Robbins –John Wiley - s -2nd Edition.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to Cos
CO1	Understand the concepts ac voltage controllers, and PWM control.	**PO1,PO2,PO3**
CO2	Analyze the working of cyclo-converters and dual converters.	**PO1,PO2,PO3**
CO3	Analyze three phase converters.	**PO1,PO2**
CO4	Design DC to DC buck boost regulators	**PO1,PO2,PO3**
CO5	Using pulse width modulated inverters for harmonic reduction.	**PO1,PO2,PO3,PO5**

CO-PO MAPPING

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-		-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-		-	-	-	-	-	-	-
CO5	3	2	2	-	2	-	-	-	-	-	-	-
CO*	**3**	**2.5**	**2**	-	2	-	-	-	-	-	-	-

M.TECH I-I SEM (PE)	POWER ELECTRONIC CONTROL	L	T	P	C
SUB CODE: 20MPE012	OF DC DRIVES	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce electric circuits and its analysis
2. To learn phasor diagrams and analysis of single phase circuits
3. To introduce the phenomenon of resonance in coupled circuits.
4. To impart knowledge on solving circuits using network theorems

UNIT-I: CONTROLLED BRIDGE RECTIFIER (1-Φ and 3-Φ) WITH DC MOTOR LOAD (9)
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 –Three phase semi converter and three phase full converter for continuous and discontinuous modes of operation – Power and power factor – Addition of Freewheeling diode – Three phase double converter.

UNIT-III: THREE PHASE NATURALLY COMMUTATED BRIDGE CIRCUIT AS A RECTIFIER OR AS AN INVERTER (9)
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 CONTROLLED DC MOTOR DRIVES (9)
Three phase controlled converter - Control circuit - Control modeling of three phase converter – Steady state analysis of three phase converter control DC motor drive – DC motor and load - Converter-Current and Speed controllers - Design of controllers - Motor equations – Filter in the speed feedback loop speed controller – Current reference generator – Current controller and flow chart for simulation – Harmonics and associated problems – Sixth harmonics torque.

UNIT-IV: CHOPPER CONTROLLED DC MOTOR DRIVES (9)
Principle of operation of the chopper – Four quadrant chopper circuit – Chopper for inversion – Chopper with other power devices – Model of the chopper –Input to the chopper – Steady state analysis of chopper controlled DC motor drives – Rating of the devices – Pulsating torque.

UNIT- V: CLOSED LOOP OPERATION AND SIMULATION OF DC MOTOR DRIVES (9)
Speed controlled drive system – Current control loop – Pulse width modulated current controller – hysterisis current controller – Modeling of current controller – Design of current -Dynamic simulations of the speed controlled DC motor drives – Speed feedback speed controller – Command current generator – current controller.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on three phase balanced and unbalanced circuits and Analyze unbalanced three phase circuits by different methods	PO1,PO2
CO2	To determine and analyze the transient response of RL,RC and RLC circuits and the solutions for different types of excitations	PO1,PO2
CO3	Demonstrate knowledge on graph theory and Analyze the networks with different network reduction methods	PO1,PO2
CO4	To determine and analyze the different two port networks	PO1,PO2
CO5	Demonstrate knowledge on attenuator and filters and design different types of attenuator and filters	PO1,PO2,PO3

TEXT BOOKS:

1. "Power Electronics and motor control" – II Edn - Shepherd - Hulley - Liang –- CU Press- New York
2. "Electric motor drives modeling" - Analysis and control – I Edn -2002- R. Krishnan –- PHI- New Delhi.

REFERENCES BOOKS:

1. "Power Electronic Circuits, Devices and Applications" – 3rd Edn- 2005 - M.H.Rashid–PHI - New Delhi.
2. "Fundamentals of Electric Drives" –2009- G. K. Dubey – Narosa Publications – New Delhi.
3. "Power Semiconductor drives" - II Edn - 1984– S.B. Dewan and A. Straughen – John Wiley & Sons - Singapore.

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

M.TECH I-I SEM (PE)	CONTROL SYSTEM DESIGN FOR POWER	L	T	P	C
SUB CODE: 20MPE013	ELECTRONICS	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To impart knowledge on modeling of power converters
2. To demonstrate knowledge on controller design for power converters
3. To analyze the conceptual bridges between the fields of Control Systems and Power Electronics
4. To understand modern linear and nonlinear control strategies power electronics devices
5. To impart design techniques of feedback controllers in Power Electronics

Unit - I: MODELLING OF DC-TO-DC POWER CONVERTERS (9)

Modelling of Buck Converter , Boost Converter ,Buck-Boost Converter, Cuk Converter ,Sepic Converter, Zeta Converter, Quadratic Buck Converter ,Double Buck-Boost Converter, Boost- Boost Converter General Mathematical Model for Power Electronics Devices

Unit - II: SLIDING MODE CONTROLLER DESIGN (9)

Variable Structure Systems. Single Switch Regulated Systems Sliding Surfaces, Accessibility of the Sliding Surface Sliding Mode Control Implementation of Boost Converter ,Buck-Boost Converter, Cuk Converter ,Sepic Converter, Zeta Converter, Quadratic Buck Converter,Double Buck-Boost Converter, Boost-Boost Converter

Unit - III: APPROXIMATE LINEARIZATION CONTROLLER DESIGN (9)

Linear Feedback Control, Pole Placement by Full State Feedback , Pole Placement Based on Observer Design ,Reduced Order Observers , Generalized Proportional Integral Controllers, Passivity Based Control , Sliding Mode Control Implementation of Buck Converter , Boost Converter ,Buck-Boost Converter

Unit - IV: NONLINEAR CONTROLLER DESIGN (9)

Feedback Linearization Isidori's Canonical Form ,Input-Output Feedback Linearization ,State Feedback Linearization, Passivity Based Control , Full Order Observers , Reduced Order Observers

Unit - V: PREDICTIVE CONTROL OF POWER CONVERTERS (9)

Basic Concepts, Theory, and Methods, Application of Predictive Control in Power Electronics, AC-DC-AC Converter System, Faults and Diagnosis Systems in Power Converters.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate knowledge on modeling of power converters	PO1,PO2,PO12
CO2	Impart knowledge on controller design for power converters	PO1,PO2,PO3
CO3	Analyze the conceptual bridges between the fields of Control Systems and Power Electronics	PO1,PO2,
CO4	Understand modern linear and nonlinear control strategies power electronics devices	PO1,PO2,PO12
CO5	Impart design techniques of feedback controllers in Power Electronics	PO1,PO2,PO3

TEXT BOOKS:

1. HeberttSira-Ramírez PhD, Ramón Silva-Ortigoza, "Control Design Techniques inPower Electronics Devices", Springer 2012
2. Mahesh Patil, PankajRodey, "Control Systems for Power Electronics: A Practical Guide", Springer India, 2015.

REFERENCE BOOK:

1. Blaabjerg José Rodríguez, "Advanced and Intelligent Control in Power Electronics and Drives" , Springer, 2014
2. Enrique Acha, VassiliosAgelidis, Olimpo Anaya, TJE Miller, "Power Electronic Control in Electrical Systems", Newnes, 2002
3. Marija D. Aranya Chakrabortty, Marija , "Control and Optimization Methods for Electric Smart Grids", Springer, 2012.

CO-PO MAPPING:

CO -PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

M.TECH I-I SEM (PE)	RESEARCH METHODOLOGY AND IPR	L	T	P	C
SUB CODE: 20MMAC11		3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To provide knowledge on various types of research problems
2. To acquire knowledge on plagiarism and research ethics
3. To provide the fundamental knowledge on writing technical paper / presentation without violating professional ethics.
4. To introduce the fundamental aspects of intellectual property Rights to students who are going to play a major role in development of innovative projects in industries/societies.
5. To disseminate knowledge on copyrights and its related rights and registration aspects

UNIT – I: RESEARCH PROBLEM FORMULATION (9)

Meaning of research problem – Sources of research problem – Criteria characteristics of a good research problem – Errors in selecting a research problem – Scope and objectives of research problem – Approaches of investigation of solutions for research problem, data collection, analysis, interpretation and necessary instrumentations.

UNIT – II: LITERATURE REVIEW (9)

Effective literature studies approaches and analysis – Plagiarism information, software and analysis – Research ethics.

UNIT – III: TECHNICALWRITING /PRESENTATION (9)

Effective technical writing – How to write the project report – How to write the technical paper/magazine – Developing a research proposal – Format of research proposal – A presentation and assessment by a review committee.

UNIT – IV: INTELLECTUAL PROPERTY RIGHTS (IPR) (9)

Nature of Intellectual Property: Patents – Designs – Trade and Copyright. **Process of Patenting and Development:** Technological research, innovation, patenting, development – Procedure for grants of patents, Patenting under PCT. **International Scenario:** International co-operation on intellectual property. **Patent Rights:** Scope of patent rights – Licensing and transfer of technology – Patent information and databases – Geographical indications. **New Developments in IPR:** Administration of patent system – IPR of biological systems, computer software, electronic system, mechanical and automotive system etc., Traditional knowledge case studies on IPR and IITs.

UNIT – V: INTRODUCTION TO COPYRIGHTS (9)

Introduction to Copyrights: Principles of copyright – Technical/subject matters of copyright – Rights afforded by copyright law – Copyright ownership – Transfer and duration – Right to prepare derivative works – Rights of distribution – Rights of performers – Copyright formalities and registration – Limitations– Infringement of copyright – International copyright law – Protection Act.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, Students will be able to		POs related to COs
CO1	Understand and analyze various types of Research Problems	**PO1, PO2**
CO2	Demonstrate knowledge on Plagiarism and Research ethics	**PO1, PO2, PO8**
CO3	Understand and analyze the basics of Research Proposals	**PO1, PO2, PO8**
CO4	Demonstrate knowledge on patent and PCT	**PO1, PO2, PO8**
CO5	Demonstrate knowledge on copyrights for their innovative works	**PO1, PO2, PO8**

TEXT BOOKS:

1. Research Methodology: A Step by Step Guide for Beginners, Ranjit Kumar, 2/e, 2005, Pearson Education.
2. Resisting Intellectual Property, Debora J. Halbert, 2006, Taylor & Francis Ltd ,2007.

REFERENCE BOOKS:

1. Research Methodology: An Introduction for Science & Engineering Students, Stuart Melville and Wayne Goddard, 2/e, 1996, Juta and Co Ltd.,
2. Research Methodology: Methods and Techniques, C.R. Kothari and Gaurav Garg, 4/e, 2019, New Age International Publishers, New Delhi.
3. Intellectual Property in the New Technological Age, 2016: Vol. I Perspectives, Trade Secrets and Patents, Peter S. Menell, Mark A. Lemley, and Robert P. Merges. 2016.
4. Intellectual Property in the New Technological Age, 2016: Vol. II Copyrights, Trademarks and State IP Protections, Peter S. Menell, Mark A. Lemley, and Robert P. Merges. 2016.
5. Intellectual Property Rights Law in India, T. Ramappa, 2/e, 2016, Asia Law House.

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	2	-	-	-	-
CO3	3	2	-	-	-	-	-	2	-	-	-	-
CO4	3	2	-	-	-	-	-	3	-	-	-	-
CO5	3	2	-	-	-	-	-	3	-	-	-	-
CO*	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2.5**	**-**	**-**	**-**	**-**

M.TECH I-I SEM (PE)	EXCITATION OF SYNCHRONOUS MACHINES	L	T	P	C
SUB CODE: 20MPE014A	AND THEIR CONTROL	3	0	0	3
	(CORE ELECTIVE-I)				

COURSE EDUCATIONAL OBJECTIVES:

1. To know about Excitation Systems
2. To make the student understand the DC Excitation Systems
3. To provide knowledge about Static and Separately Excitation Systems
4. To Understand the Concept of Brushless Excitation Systems
5. To know concept of Excitation control.

UNIT- I: EXCITATION SYSTEMS **(9)**

Principal Controls of a generating unit. Arrangement of excitation components, voltage response-ratio .Excitation specifications. Ceiling voltage, time constant and response of excitation systems. Requirements of excitation systems: Classification of excitation systems.

UNIT- II: D.C. EXCITATION SYSTEMS **(9)**

configuration of DC excitation system with main and pilot exciters. Amplidyne and magnetic amplifier. Automatic voltage regulator with magnetic amplifier and Amplidyne. Limitation and problems of DC excitation systems. Improvement in DC excitation system.

UNIT- III: STATIC AND SEPARATELY EXCITATION SYSTEMS **(9)**

AC Shunt Excitation Systems (Static Rectifier Excitation Systems): Static thyristor rectifier schemes. Transient Response during fault condition. Use of booster transformer. Application for shunt excitation systems.AC Separately Excitation Systems. (Alternator- Rectifier Excitation System): Scheme of alternator-rectifier excitation system with (i) diode rectifier and (ii) thyristor rectifier.Comparison and Application of these schemes. Harmful effects of static excitation systems or system machine components, means of prevention.

UNIT- IV: BRUSHLESS EXCITATION SYSTEMS **(9)**

Brush-slip ring problem. Scheme of Brushless excitation system with rotating diode. Control, protection and monitoring of Brushless excitation system. Introduction to brushless excitation system with rotating thyristors.Introduction to Superconducting Exciter.Automatic Voltage Regulator (AVR): Solid state automatic voltage regulator scheme. Auto and manual follow-up. Thyristor converter and AVR protection. Introduction to Digital AVR.

UNIT-V: EXCITATION CONTROL **(9)**

Introduction to power stabilizing signal-speed, frequency and power signals. Rotor current limiter, MVAR limiter. Effect of excitation on generator power limits, Dynamic and Transient stabilities.

TOTAL: 45 HOURS

Course Outcomes:

On successful completion of the course, students will be able to		Pos related to Cos
CO1	Get knowledge on Excitation Systems	PO1, PO3
CO2	Understood the DC Excitation Systems	PO1, PO3
CO3	knowledge about Static and Separately Excitation Systems	PO1,PO3
CO4	Understood the Concept of Brushless Excitation Systems	PO1,PO3
CO5	Get knowledge on Excitation control.	PO1,PO3

TEXT BOOK

1. Electric machines Fitzgerald & Kingsley (Mc Graw Hill)
2. Electric machinery and transformer M.Kosow. (PHI)

REFERENCE BOOKS:

1. Theory of alternating current machines A.S. Langsdorf
2. Electrical machines Nagrath & Kothari (TMH)
3. Performance,design and testing of A.C. machines MG Say (CBS,Delhi)

CO-PO MAPPING

CO -PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-	-
CO3	3	-	3	-	-	-	-	-	-	-	-	-
CO4	3	-	3	-	-	-	-	-	-	-	-	-
CO5	3	-	3	-	-	-	-	-	-	-	-	-
CO*	**3**	**-**	**3**	-	-	-	-	-	-	-	-	-

M.TECH I-I SEM (PE)	FPGA BASED DEGITAL SYSTEM DESIGN	L	T	P	C
SUB CODE: 20MPE014B	(CORE ELECTIVE-I)	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

The student will be able:

1. To Design and optimize complex combinational and sequential digital circuits
2. To Model combinational and sequential digital circuits by Verilog HDL
3. To Design and model digital circuits with Verilog HDL at behavioral, structural, anRTLLevels
4. To Develop test benches to simulate combinational and sequential circuits.
5. To Understand the FPGA Architecture

Unit-I: INTRODUCTION TO FPGAS **(9)**

Introduction, Field-programmable Gate Arrays, Programmability and DSP, History of the Microchip, Technology Offerings, Influence of Programmability, Challenges of FPGAs.

Unit -II: VERILOG HDL CODING STYLE : **(9)**

Lexical Conventions - Ports and Modules — Operators -Gate Level Modelling - System Tasks & Compiler Directives - Test Bench - Data Flow Modeling - Behavioral level Modeling -Tasks & Functions

Unit III: VERILOG MODELING OF COMBINATIONAL & SEQUENTIAL CIRCUITS **(9)**

Behavioral, Data Flow and Structural Realization — Adders — Multipliers- Comparators - Flip Flops -Realization of Shift Register - Realization of a Counter- Synchronous and Asynchronous FIFO — Single port and Dual port RAM — Pseudo Random LFSR — Cyclic Redundancy Check

Unit IV: SYNCHRONOUS SEQUENTIAL CIRCUIT: **(9)**

State diagram-state table —state assignment-choice of flip-flops — Timing diagram —One hot encoding- Mealy and Moore state machines — Design of serial adder using Mealy and Moore state machines - State minimization — Sequence detection- Design of vending machine using One Hot Controller

Unit V: FPGA AND ITS ARCHITECTURE: **(9)**

Types of Programmable Logic Devices- PLA & PAL- FPGA Generic Architecture. ALTERA Cyclone II Architecture — Timing Analysis and Power analysis using Quartus-II- SOPC Builder- NIOS-II Soft-core Processor- System Design Examples using ALTERA FPGAs — Traffic light Controller, Real Time Clock - Interfacing using FPGA: VGA, Keyboard, LCD.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Design and optimize complex combinational and sequential digital circuits	PO1, PO5, PO11,PO12
CO2	Model combinational and sequential digital circuits by Verilog HDL	PO1, PO5,PO11,PO12
CO3	Design and model digital circuits with Verilog HDL at behavioral, structural and RTL Levels	PO1,PO2, PO5, PO11,PO12
CO4	Develop test benches to simulate combinational and sequential circuits.	PO1, PO2,PO3,PO5, PO11,PO12
CO5	Understand the FPGA Architecture	PO1, PO5,PO11,PO12

TEXT BOOKS:

1. S.Ramachandran," Digital VLSI System Design: A Design Manual for Implementation of Projects on FPGAs and ASICs Using Verilog" Springer Publication,2007
2. Samir Palnitkar,"Verilog HDL: A Guide to Digital Design and Synthesis" PrenticeHall, Second Edition,2003 3. Roger Woods,John McAllister,Gaye Lightbody,Ying Yi "FPGA based Implementation of Signal Processing Systems" John Wiley & Sons, Ltd,2008.

REFERENCES BOOKS:

1. Charles H Roth, Jr "Digital Systems design using VHDL", Thomson Books/Cole
2. Wayne Wolf, "FPGA Based System Design", Prentices Hall Modern SemiconductorDesign Serie
3. Mark Balch, "Complete Digital design — A Comprehensive Guide to Digital Electronics and Computer system Architecture," Mc Graw Hill, 2007

CO-PO MAPPING

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	2	-	-	-	-	-	2	2
CO2	3	-	-	-	2	-	-	-	-	-	2	2
CO3	3	2	-	-	2	-	-	-	-	-	2	2
CO4	3	2	2	-	2	-	-	-	-	-	2	2
CO5	3	-	-	-	2	-	-	-	-	-	2	2
CO*	3	2	2		2						2	2

M.TECH I-I SEM (PE)	NEURAL NETWORKS AND FUZZY SYSTEMS	L	T	P	C
SUB CODE: 20MPE014C	(CORE ELECTIVE-I)	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To learn about the basics of Artificial neuron, and neural networks.
2. To impart knowledge on Operation of feed forward neural networks
3. To understand about associative memories.
4. To understand about SOM.
5. To impart knowledge on fuzzy systems.

UNIT-I: NEURAL NETWORKS (9)

Introduction - Humans and Computers - Organization of the Brain - Biological Neuron - Biological and Artificial Neuron Models - Hodgkin-Huxley Neuron Model - Integrate-and-Fire Neuron Model - Spiking Neuron Model - Characteristics of ANN - McCulloch-Pitts Model - Historical Developments - Potential Applications of ANN.Artificial Neuron Model - Operations of Artificial Neuron - Types of Neuron Activation Function - ANN Architectures - Classification Taxonomy of ANN-Connectivity - Neural Dynamics (Activation and Synaptic) - Learning Strategy (Supervised - Unsupervised - Reinforcement) - Learning Rules - Types of Application.

UNIT-II: SINGLE AND MLTI LAYER FEED FORWARD NEURAL NETWORKS (9)

Introduction - Perceptron Models: Discrete - Continuous and Multi-Category - Training Algorithms: Discrete and Continuous Perceptron Networks - Perceptron Convergence theorem - Limitations of the Perceptron Model - Applications.Credit Assignment Problem - Generalized Delta Rule - Derivation of Backporpagation (BP) Training - Summary of Backpropagation Algorithm - Kolmogorov Theorem - Learning Difficulties and Improvements.

UNIT-III: ASSOCIATIVE MEMORIES (9)

Paradigms of Associative Memory - Pattern Mathematics - Hebbian Learning - General Concepts of Associative Memory (Associative Matrix - Association Rules - Hamming Distance - The Linear Associator - Matrix Memories - Content Addressable Memory) - Bidirectional Associative Memory (BAM) Architecture - BAM Training Algorithms: Storage and Recall Algorithm - BAM Energy Function - Proof of BAM Stability Theorem. Architecture of Hopfield Network: Discrete and Continuous versions - Storage and Recall Algorithm - Stability Analysis - Capacity of the Hopfield Network.

UNIT-IV: SELF-ORGANIZING MAPS (SOM) AND ADAPTIVE RESONANCE THEORY (ART) (9)

Introduction - Competitive Learning - Vector Quantization - Self-Organized Learning Networks - Kohonen Networks - Training Algorithms - Linear Vector Quantization - Stability-Plasticity Dilemma - Feed forward competition - Feedback Competition - Instar - Outstar - ART1 - ART2 - Applications.

UNIT-V: FUZZY LOGIC SYSTEM AND APPLICATIONS (9)

Introduction to classical sets – properities - Operations and relations; Fuzzy sets - Membership - Uncertainity - Operations - Properities - fuzzy relations - cardinalities - membedship functions.Fuzzification - Membership Value assignment - development of rule base and decision making system - Defuzzification to crisp sets - Defuzzification methods.

Neural network applications: Process identification - Fraction Approximation - Control and Process Monitoring - Fault diagnosis and Load forecasting.

Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand the concepts NN basic models.	PO1,PO2,PO3
CO2	Analyze the single layer feed forward neural networks.	PO1,PO2,PO3
CO3	Implement different types of associative memories.	PO1,PO2
CO4	Understand SOM and ART neural networks.	PO1,PO2,PO3
CO5	Implement Fuzzy logic and systems.	PO1,PO2,PO3,PO5

TEXT BOOK:

1. Neural Netwroks - Fuzylogic - Gnenetic algorithms: synthesis and applications by Rajasekharan and Rai- PHI Publication.
2. Introduction to Artificial Neural Systems- JacekM.Zurada - Jaico Publishing House - 1997.

REFERENCE BOOKS:

1. Neural Netwroks – Simon Hykins - Pearson Education.
2. Neural Netwroks and Fuzzy Logic System by BrokKosko - PHI Publications

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-		-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-		-	-	-	-	-	-	-
CO5	3	2	2	-	2	-	-	-	-	-	-	-
CO*	3	2.6	2	-	2							

M.TECH I-I SEM (PE)	POWER QUALITY IMPROVEMENTS	L	T	P	C
SUB CODE: 20MPE014D	(CORE ELECTIVE-I)	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To impart knowledge on maintaining power quality
2. To learn about electrical transients and their effects.
3. To understand about the harmonic content of voltage and current.
4. To impart knowledge on Electromagnetic Interference.
5. To impart knowledge on Power Quality Measurements.

UNIT I: INTRODUCTION TO POWER QUALITY AND POWER FREQUENCY DISTURBANCE **(9)**

Introduction to Power Quality - Power Quality Issues - Susceptibility Criteria - Role of Power Suppliers and Users - Power Quality Standards. Introduction to Power Frequency Disturbances - Common Power Frequency Disturbances - Cures for Low Frequency Disturbances – Voltage Tolerance Criteria.

UNIT II: ELECTRICAL TRANSIENTS **(9)**

Introduction to Transients - Transient System Model - Examples of Transient Models and their Response - Types and Causes of Transients - Examples of Transient Waveforms – Three Phase unbalance – single phase faults – phase to phase faults – two phase to ground faults – seven tips of three phase unbalanced sag.

UNIT III: HARMONICS **(9)**

Definition of Harmonics - Odd and Even Order Harmonics - Harmonic Phase Rotation and Phase Angle – Causes of Voltage and Current Harmonics – Individual and Total Harmonic Distortion - Harmonic Signatures - Effect of Harmonics on Power System Devices - Guidelines for Harmonic Voltage and Current Limitation - Harmonic Current Mitigation.

UNIT IV: ELECTROMAGNETIC INTERFERENCE **(9)**

Introduction to EMI - Frequency Classification - Electrical Fields - Magnetic Fields - EMI Terminology - Power Frequency Fields - High Frequency Interference - EMI Susceptibility - EMI Mitigation - Health Concerns of EMI.

UNIT V: POWER QUALITY PROBLEMS – EMI IMPACT **(9)**

Introduction to Power Quality Measurements - Power Quality Measurement Devices - Power Quality Measurements - Test Locations - Test Duration - Instrument Setup - Instrument Guidelines

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos related to Cos
CO1	Understand the concepts on power quality.	PO1,PO2
CO2	Understand electrical transients.	PO1,PO2
CO3	Analyze the harmonic content of voltage and current	PO1,PO2,PO3
CO4	Understand effects of Electromagnetic Interference.	PO1,PO2,PO5
CO5	Choose power quality measuring equipments.	PO1,PO2,PO3

TEXT BOOKS:

1. Power quality by C. Sankaran, CRC Press
2. Electrical Power Systems Quality, Roger C. Dugan, Mark F. McGranaghan, SuryaSantoso, H.Wayne Beaty, 2nd Edition, TMH Education Pvt. Ptd.

REFERENCE BOOKS:

1. Understanding Power quality problems by Math H. J. Bollen IEEE Press
2. Power quality enhancement using custom power devices by Arindam Ghosh,Gerard Ledwich,Kluwer academic publishers

CO-PO MAPPING

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-		-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**2**	-	-	-	-	-	-	-	-	-

M.TECH I-I SEM (PE)	APPLICATION OF POWER ELECTRONICS IN SMART GRID	L	T	P	C
SUB CODE: 20MPE015A	(CORE ELECTIVE-II)	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To impart knowledge on fundamental problems of electrical power systems
2. To impart knowledge on general problems and solutions of power control
3. To impart knowledge on different high frequency application
4. To learn factors affecting the Distributed generation with power system.
5. To learn energy issues in energy storage system.

UNIT I: INTRODUCTION (9)

Introduction to smart grid, electricity network, local energy networks, electric transportation, low carbon central generation, fundamental problems of electrical power systems, power flow control, distributed generation and energy storage, attributes of the smart grid, alternate views of smart grid.

UNIT II: POWER CONTROL AND QUALITY PROBLEMS (9)

Introduction, general problems and solutions of power control, power quality and EMC, power quality issues, monitoring, legal and organizational regulations, mitigation methods and EMC related phenomena in smart system, ECM cases in distributed power system.

UNIT III: HIGH FREQUENCY AC POWER DISTRIBUTION PLATFORM (9)

Introduction, high frequency in space applications, telecommunications, computer and commercial electronics system, automotive and motor drives micro grids.
Active Power Controllers: Dynamic static synchronous controllers, D-STATCOM, Dynamic static synchronous series controllers, dynamic voltage restorer, AC/AC voltage regulators.

UNIT IV: INTEGRATION OF DISTRIBUTED GENERATION WITH POWER SYSTEM (9)

Distributed generation past and future, interconnection with a hosting grid, integration and interconnection concerns, power injection principle, injection using static compensators and advanced static devices, distributed generation contribution to power quality problems and current challenges.

UNIT V: ENERGY STORAGE SYSTEMS (9)

Introduction, structure of power storage devices, pumped-storage hydroelectricity, compressed air energy storage system, flywheels, battery storage, hydrogen storage, super conducting magnet energy storage, super capacitors, applications of energy storage devices.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand the concepts on fundamental problems of electrical power systems.	PO1,PO3
CO2	Understand the power control quality issues.	PO1,PO2
CO3	Analyze performance of High frequency AC power distribution.	PO1,PO2
CO4	Analyze factors affecting the Distributed generation with power system	PO1,PO2
CO5	Understand energy issues in energy storage system.	PO1,PO2,PO3

TEXT BOOKS:

1. James Momoh, "Smart Grid: Fundamentals of design and analysis", John Wiley & sons Inc,IEEE press 2012.
2. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", John Wiley & sons inc, 2012.
3. Strzelecki Benysek, "Power Electronics in Smart Electrical Energy Networks", Springer, 2008.
4. Clark W Gellings, "The Smart Grid: Enabling Energy Efficient and Demand Side Response", CRC Press, 2009.

REFERENCE BOOKS:

1. Fereidoon P. Sioshansi, "Smart Grid: Integrating Renewable, Distributed & Efficient Energy", Academic Press, 2012.
2. Clark W.Gellings, "The smart grid: Enabling energy efficiency and demand response", Fairmont Press Inc, 2009.

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-		-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.5**	**2**	-	-	-	-	-	-	-	-	-

M.TECH I-I SEM (PE)	SOLAR ENERGY CONVERSION SYSTEMS	L	T	P	C
SUB CODE: 20MPE015B	(CORE ELECTIVE-II)	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To impart knowledge on fundamentals of solar cells, and sun tracking.
2. To learn the basic design principle of solar cells.
3. To impart knowledge on photovoltaic modules, and their power output.
4. To impart knowledge on selection of battery, converters.
5. To impart knowledge on design of PV systems for different applications.

UNIT-I: SOLAR CELL FUNDAMENTALS (9)

Introduction to PV, world energy scenario – need for sustainable energy sources – current status of Renewable energy sources – place of photovoltaic in Energy supply – solar radiation – the sun and earth movement – angle of sunrays on solar collectors – sun tracking – estimating solar radiation empirically – measurement of solar radiation.

UNIT-II: DESIGN OF SOLAR CELLS (9)

Introduction to Solar cells, Solar cell design- design for high ISC – design for high VOC – design for high F,F upper limits of cell parameters – short circuit current, open circuit voltage, fill factor, efficiency, losses in solar cells – model of a solar cell, effect of series and shunt resistance on efficiency , effect of solar radiation on efficiency, Analytical techniques.

UNIT-III: SOLAR PHOTOVOLTAIC MODULES (9)

Solar PV Modules from solar cells – 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-V: BALANCE OF SOLAR PV SYSTEMS (9)

Basics of Electromechanical cell – factors affecting performance – batteries for PV systems – DC to DC converters – charge controllers – DC to AC converters(Inverters) – Maximum Power Point tracking (MPPT) – Algorithms for MPPT.

UNIT V: PV SYSTEM DESIGN AND APPLICATIONS (9)

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.

TOTAL: 45 HOURS

TEXT BOOKS:

1. "Solar Photovoltaics Fundamentals, Technologies and Applications" by Chetan singhsolanki, PHI publications.

REFERENCES:

1. Solar Energy Fundamentals and applications by H.P. Garg, J. Prakash "Tata McGraw- Hill publishers Ist edition"
2. S.Rao & B.B.Parulekar, "Energy Technology", 4th edition, Khanna publishers, 2005.

Course Outcomes:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand the concepts on of solar cells, and sun tracking.	PO1,PO3
CO2	Design solar cells for specific application.	PO1,PO2,PO3,PO5
CO3	Analyze photovoltaic modules, and their power output.	PO1,PO2
CO4	Analyze selection of battery, converters.	PO1,PO2
CO5	Design of PV systems for different applications.	PO1,PO2,PO3,PO5

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-		-	-	-	-	-	-	-
CO2	3	3	2	-	2	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	2	-	-	-	-	-	-	-
CO*	**3**	**2.5**	**2**	-	**2**	-	-	-	-	-	-	-

M.TECH I-I SEM (PE)	SOLID STATE LIGHTING AND CONTROL	L	T	P	C
SUB CODE: 20MPE015C	(CORE ELECTIVE-II)	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1: To introduce the concept of Solid State Lighting and to impart the skills necessary for implementing light emitting diode in various sectors of illumination.
2: To Redesigning an existing office and educational facility with LED luminaries,

3: To provide knowledge on different converters and closed loop control of LED

4: To Redesigning an existing office and educational facility with OLED luminaries,

5: To demonstrate knowledge on Application of LEDs

UNIT-I: FUNDAMENTALS OF LIGHTING & TERMINOLOGIES (9)

Generation of radiation, CCT, CRI & CT, Review of Light sources, Solid State Lighting Photons emission in LEDs, Life cycle of photon, Overall, Internal, External & Extraction efficiency of photons in LEDs, Optical characteristics of LED, Light escape cone and its relevance in LED design & Numerical Lambertian Radiation pattern .

UNIT-II : LEDS & WHITE LIGHT GENERATION (9)

Role of extraction efficiency & methods to increase it Materials used for LEDs,Different types of LEDs, manufacturing technology White light generation, Challenges & Issues, RGB LED – CIE x-y chromaticity diagram, Advantages & disadvantages , Electrical Characteristics of LED & dependence of photometry Driver circuits – linear regulators, resistive circuits & current mirror

UNIT-III : DRIVING CIRCUITS FOR LEDS (9)

Switching Regulators – Buck Converter Boost Converter, Buck Boost Converter, SEPIC Converter, Numerical on Driver design for LEDs, Necessity of closed control loop & its considerations, closed loop control of LED, Dimming approaches.

UNIT-IV : DESIGN OF LED LUMINAIRES (9)

Redesigning an existing office and educational facility with LED luminaire, Lighting quality and Energy conservation analysis of redesigned facility. OLEDs and its types, principle, advantages , disadvantages and application, AC LEDs and its challenges, Selecting components for drivers

UNIT-V : APPLICATION OF LEDS (9)

Traffic lights, Automotive signage, Displays- Alphanumeric displays, Full color video displays ,Medical Applications- phototherapy of neonatal jaundice, Photo dynamic therapy, photo synthesis- plant growing, photo bioreactors.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to Cos
CO1	To demonstrate knowledge on the concepts of Solid State Lighting	PO1,PO2,PO3
CO2	To know the concept of control mechanisms and LQG control	PO1,PO2,PO3
CO3	To understand the adaptive control problem, basic models of adaptive control	PO1,PO2, PO3
CO4	To implement light emitting diode in various sectors of illumination.	PO1,PO2,PO3
CO5	To redesigning an existing office and educational facility with OLED luminaire	PO1,PO2,PO3,PO12

TEXT BOOKS:

1. Arturas Zukauskus, Michael S. Shur and Remis Gaska, “Introduction to solid state lighting”, wiley interscience 2002.
2. Mohan Underland and Robbins, “ Power Electronic converters, Applications and Design”, John Wiley and sons, 1989
3. Patrick Mottier, “LEDs for Lighting Applications”, John Wiley & Sons, 2009

REFERENCE BOOKS:

1. E Fred Schubert, “ Light emitting Diodes” (2nd Edition), Cambridge University press,2006
2. Gilbert Held, “Introduction to Light Emitting Diode Technology and Applications”, CRC press, 2009
3. Application Notes from Texas Instruments, National semiconductors, Hitachi

CO-PO Mapping

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	2
CO*	**3**	**2.6**	**2**	-	-	-	-	-	-	-	-	**2**

M.TECH I-I SEM (PE)	DIGITAL CONTROLLER APPLICATION IN	L	T	P	C
SUB CODE: 20MPE015D	POWER CONVERTERS	3	0	0	3
	(CORE ELECTIVE-II)				

COURSE EDUCATIONAL OBJECTIVES:

1	To gain knowledge about memory system
2	To know the operation Multiplexing and Interrupts
3	To know the concept of ADC and Event manager
4	To know the concept of FPGA
5	To understand the control circuitry of digital controller

UNIT I: INTRODUCTION **(9)**

Introduction to the C2xx DSP core and code generation, The components of the C2xx DSP core, Mapping external devices to the C2xx core , peripherals and Peripheral Interface, System configuration registers , Memory , Types of Physical Memory , memory Addressing Modes , Assembly Programming using C2xx DSP, Instruction Set, Software Tools.

UNIT II: Multiplexing and Interrupts **(9)**

Pin Multiplexing (MUX) and General Purpose I/O Overview, Multiplexing and General Purpose I/O Control Registers .Introduction to Interrupts, Interrupt Hierarchy, Interrupt Control Registers, Initializing and Servicing Interrupts in Software.

UNIT III: ADC OVERVIEW **(9)**

ADC Overview , Operation of the ADC in the DSP , Overview of the Event manager (EV) , Event Manager Interrupts , General Purpose (GP) Timers , Compare Units, Capture Units And Quadrature Enclosed Pulse (QEP) Circuitry , General Event Manager Information

UNIT IV: INTRODUCTION TO FPGA **(9)**

Introduction to Field Programmable Gate Arrays – CPLD Vs FPGA – Types of FPGA, Xilinx XC3000 series , Configurable logic Blocks (CLB), Input/output Block (IOB) – Programmable Interconnect Point (PIP) – Xilinx 4000 series – HDL programming –overview of Spartan 3E and Virtex II pro FPGA boards-case study.

UNIT V: POWER SUPPLY **(9)**

Controlled Rectifier, Switched Mode Power Converters, PWM Inverters, DC motor control, Induction Motor Control

TOTAL: 45 HOURS

TEXT BOOKS:

1. Hamid.A.Toliyat and Steven G.Campbell " DSP Based Electro Mechanical Motion Control " CRC Press New York , 2004
2. XC 3000 series datasheets (version 3.1). Xilinx,Inc.,USA, 1998

REFERENCES:

1. XC 4000 series datasheets (version 1.6). Xilinx,Inc.,USA, 1999
2. Wayne Wolf," FPGA based system design ", Prentice hall, 2004

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Design about memory system	PO1,PO2
CO2	Understand the Multiplexing and Interrupts	PO1,PO2,
CO3	Develop the concept of ADC	PO1,PO2,PO3
CO4	Understand and Design FPGA .	PO1,PO2,PO3
CO5	Identify the importance of control circuitry	PO1,PO2,PO3

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2		-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	2	2	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2**	**2**	**2**	-	-	-	-	-	-	-

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.

(AUTONOMOUS-NAAC ACCREDITED)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

		L	T	P	C
M.TECH I-I SEM (PE)	**POWER CONVERTERS LAB -I**	-	-	4	2
SUB CODE: 20MPE016					

COURSE EDUCATIONAL OBJECTIVES:

1: To demonstrate knowledge on different power electronic converters.

2: To analyze the performance of Controlled rectifiers.

3: To impart knowledge and analyze the performance characteristics of DC drive.

4: To determine various parameters of DC drives in closed loop control.

5: To evaluate the performance and efficiency of DC drives in closed loop control

Conduct Any TEN of the following:

List of Experiments:-

1. SINGLE PHASE CONTROLLED BRIDGE CONVERTER FOR R & RL LOADS
2. THREE PHASE CONTROLLED BRIDGE CONVERTER WITH R &RL LOADS
3. OUTPUT VOLTAGE AND CURRENT CHARACTERISTICS OF DC-DC BUCK BOOST CONVERTER WITH R & RL LOADS
4. OUTPUT VOLTAGE CHARACTERISTICS OF DC-DC BUCK CONVERTER WITH R & RL LOADS USING FPGA CONTROLLER
5. DC OUTPUT VOLTAGE & AC LINK VOLTAGE CHARACTERISTICS OF ISOLATED DC-DC RESONANT CONVERTER
6. STEP DOWN AND STEP UP MOSFET BASED CHOPPERS
7. OUTPUT VOLTAGE AND CURRENT CHARACTERISTICS OF DC-DC FORWARD CONVERTER WITH R & RL LOADS
8. SPEED MEASUREMENT & CLOSED LOOP CONTROL USING PMDC MOTOR.
9. THYRISTORISED DRIVE FOR PMDC MOTOR WITH SPEED MEASUREMENT & CLOSED LOOP CONTROL.
10. IGBT BASED 4 QUADRANT CHOPPER DRIVE FOR PMDC MOTOR WITH SPEED MEASUREMENT AND CLOSED LOOP CONTROL.
11. THREE PHASE INPUT - THYRISTORISED DRIVE - 3 HP DC MOTOR WITH CLOSED LOOP --CONTROL.
12. SPEED CONTROL OF SEPARATELY EXCITED DC MOTOR USING SINGLE PHASE FULL CONVERTER.
13. POWER FACTOR CORRECTION OF PIC MICROCONTROLLER BASED BOOST CONVERTER
14. MICRO CONTROLLER BASED SPEED CONTROL OF STEPPER MOTOR.

Course Outcomes:

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

Course Outcomes		POs related to COs
CO1	Demonstrate knowledge on different power electronic converters.	PO1
CO2	Analyze the performance of Controlled rectifiers and characteristics of DC drives.	PO2
CO3	Select appropriate design tools and procedure to evaluate performance of DC drives.	PO4
CO4	Apply control schemes to determine various parameters of DC drives in closed loop control.	PO5
CO5	Follow ethical principles to evaluate performance of DC drives.	PO8
CO6	Do experiments effectively as an individual and as a member in a group.	PO9
CO7	Communicate verbally and in written form, the understandings about the Experiments.	PO10
CO8	Continue updating their skill related to various testing of DC drives during their life time	PO12

CO-PO Mapping

CO -PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

M.TECH I-I SEM (PE)	POWER ELECTRONIC CONTROL CIRCUITS LAB	L	T	P	C
SUB CODE: 20MPE017		-	-	4	2

COURSE EDUCATIONAL OBJECTIVES:

1: To demonstrate knowledge on firing circuits of power electronic converters.

2: To analyze the performance of Control circuits.

3: To impart knowledge and analyze the microprocessor based firing circuits.

4: To design various control circuits of power converters with design parameters.

5: To evaluate the performance of power electronic converters with firing circuits.

Conduct Any TEN of the following:

List of Experiments:-

1. DESIGN OF UJT FIRING CIRCUIT
2. DESIGN OF RESISTANCE FIRING CIRCUIT
3. DESIGN OF RC- FIRING CIRCUIT
4. DESIGN OF FIRING PULSE CONTROL CIRCUIT USING PID
5. 555 Timer based FIRING CIRCUIT OF SCR
6. COSINE FIRINING CIRCUIT OF SCR
7. PWM TECHNIQUE BASED FIRING CIRCUIT FOR CONVERTERS
8. MICROPROCESSOR BASED FIRING CIRCUIT FOR CHOPPER
9. MICROPROCESSOR BASED FIRING CIRCUIT FOR INVERTER
10. MICROPROCESSOR BASED FIRING CIRCUIT FOR AC -DC CONVERTER
11. DESIGN OF SWITCHED MODE POWER SUPPLIES.
12. DESIGN OF UPS
13. STUDY OF POWER QUALITY ANALYSER.
14. STUDY OF DRIVER CIRCUITS AND GENERATION OF PWM SIGNALS FOR THREE PHASE INVERTERS.

COURSE OUTCOMES:

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

Course Outcomes		POs related to Cos
CO1	Demonstrate knowledge on firing circuits of power electronic converters.	PO1
CO2	Analyze the performance of Control circuits.	PO2
CO3	Design various control circuits of power electronic converters.	PO3
CO4	Select appropriate design tools and procedure to evaluate performance of power electronic converters.	PO4
CO5	Apply various control circuits in power electronic converters to evaluate Performance.	PO5
CO6	Follow ethical principles to evaluate performance of power electronic Converters.	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to various control circuits for testing of power electronic converters during their life time	PO12

CO-PO MAPPING

CO- PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

M.TECH I-II SEM (PE)	MODERN RECTIFIERS AND RESONANT	L	T	P	C
SUB CODE: 20MPE021	CONVERTERS	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1	To gain knowledge about 1-phase & full wave converter and reduction of harmonics & minimization of THD
2	To know the operation of ideal rectifiers, realization of non ideal rectifiers with control of current and hysteresis
3	To know the concept of 1-phase converter systems incorporating ideal rectifiers.
4	To know the concept of, ZCS and ZVS
5	To understand the average model for buck, boost and buck-boost converter and design of controllers.

UNIT I POWER SYSTEM HARMONICS & LINE COMMUTATED RECTIFIERS: (9)

Average power-RMS value of a waveform-Power factor-AC line current harmonic standards IEC 1000-IEEE 519- The Single phase full wave rectifier-Continuous Conduction Mode-Discontinuous Conduction Mode-Behaviour when C is largeMinimizing THD when C is small-Three phase rectifiers- Continuous Conduction Mode- Discontinuous Conduction Mode-Harmonic trap filters.

UNIT II PULSE WIDTH MODULATED RECTIFIERS: (9)

Properties of Ideal rectifiers-Realization of nonideal rectifier-Control of current waveform-Average current control-Current programmed Control- Hysteresis control- Nonlinear carrier control.

UNIT III SINGLE PHASE CONVERTER SYSTEM (9)

Single phase converter system incorporating ideal rectifiers- Modeling losses and efficiency in CCM high quality rectifiers-Boost rectifier Example - expression for controller duty cycle-expression for DC load current-solution for converter Efficiency.

UNIT IV RESONANT CONVERTERS (9)

Review on Parallel and Series Resonant Switches-Soft Switching- Zero Current Switching - Zero Voltage Switching -Classification of Quasi resonant switches- Zero Current Switching of Quasi Resonant Buck converter -Zero Current Switching of Quasi Resonant Boost converter - Zero Voltage Switching of Quasi Resonant Buck converter – Zero Voltage Switching of Quasi Resonant Boost converter - Steady State analysis.

UNIT V DYNAMIC ANLYSIS OF SWITCHING CONVERTERS (9)

Review of linear system analysis- State Space Averaging-Basic State Space Average Model-State Space Averaged model for an ideal Buck Converter, ideal Boost Converter, ideal Buck Boost Converter, for an ideal Cuk Converter -Pulse Width Modulation-Voltage Mode PWM Scheme-Current Mode PWM Scheme- Design of Controllers - PI Controller, Variable Structure Controller, Optimal Controller for the source current shaping of PWM rectifiers.

TOTAL: 45 HOURS

TEXT BOOKS:

1. Robert W. Erickson &Dragon Maksimovic:"Fundamentals of Power Electronics"2ndEdition, 2001 Springer science and Business media.
2. Mohammed H.Rashid:Power Electronics, Pearson Education- Third Edition –first Indian reprint – 2004.
3. Mohan .N, Undeland& Robbins:"Power Electronics – Converters, Application & Design", John Wiley & Sons, Inc,2nd Edition, Newyork, 2001.

REFERENCES:

1. William Shepherd and Li zhang,MarceldEkkerin.C: "Power Converters Circuits".
2. Simon Ang and Alejandro Oliva:"Power- Switching Converters", Taylor & FrancisGroup

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Design about 1-phase converter with continues and discontinues mode of operation.	PO1,PO2
CO2	Design methods to eliminate harmonics.	PO1,PO2,PO3,PO5
CO3	Develop the concept of linear and nonlinear rectifiers and its performance characteristics	PO1,PO2,PO3,PO4
CO4	Design ZCS, ZVS and buck converter with resonant control.	PO1,PO2,PO3,PO 4, PO5
CO5	Identify the importance of linear system, state space model, PI Controller and optimal controller.	PO1,PO2,PO3

CO-PO MAPPING

POCO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	3	-	2	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	2	2	2	2	-	-	-	-	-	-	-
CO5	3	2	3	-	-	-	-	-	-	-	-	-
CO*	3	2	2.5	3	2	-	-	-	-	-	-	-

M.TECH I-II SEM (PE)	POWER ELECTRONIC CONTROL OF	L	T	P	C
SUB CODE: 20MPE022	AC DRIVES	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1: To demonstrate knowledge on Control of AC drives.

2: To impart knowledge on control of induction motor drives.

3: To analyze the Control of induction motor by Vector Control Method.

4: To analyze the Control strategies of synchronous motor drives

5: To analyze the Control of various reluctance and BLDC motor drives

UNIT- 1: INTRODUCTION TO AC DRIVES (9)

Introduction to motor drives-torque production- Equivalent circuit analysis-Speed-Torque characteristics with variable voltage operation - Variable frequency operation - Constant v/f operation-Induction motor characteristics in constant torque and field weakening regions

UNIT- 2: CONTROL OF INDUCTION MOTOR DRIVES AT STATOR SIDE AND ROTOR SIDE (9)

Scalar control-Voltage fed inverter control-Open loop volts/Hz Control-Speed control slip regulation- Speed control with torque and flux control-Current controlled voltage fed inverter drive-Current fed inverter control-Independent current and frequency control-Speed and flux control in current fed inverter drive-Volts/Hertz Control current fed-Inverter drive-Efficiency optimization control by flux program Slip power recovery drives-Static Kramer Drive-Phasor diagram-Torque expression-Speed control of Kramer Drive-Static Scheribus Drive- Modes of operation

UNIT- 3: VECTOR CONTROL OF INDUCTION MOTOR DRIVES (9)

Principles of Vector Control-Vector Control Methods-Direct method of Vector control-Adaptive control principles-Self tuning regulator-Model referencing control

UNIT -4: CONTROL OF SYNCHRONOUS MOTOR DRIVES &CONTROLLERS (9)

Synchronous motor and its characteristics – Control strategies – Constant torque angle control-Unity power factor control-Constant mutual flux linkage control.Flux weakening operation-Maximum speed-Direct flux weakening algorithm – Constant torque mode controller- Flux Weakening controller- Indirect flux weakening – Maximum permissible torque-Speed control scheme- Implementation strategy – Speed controller design.

UNIT – 5: VARIABLE RELUCTANCE MOTOR DRIVE & BLDC MOTOR DRIVES(9)

Variable reluctance motor drives- Torque Production in the variable reluctance motor- Drive characteristics and control principles- Current control variable reluctance servo drive.
Three phase full wave Brushless dc motor – Sinusoidal type of Brushless dc motor-Current controlled Brushless dc servo drives

TOTAL: 45 HOURS

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

Course Outcomes		POs related to COs
CO1	Demonstrate knowledge on Control of AC drives.	PO1, PO2
CO2	Impart knowledge on control of induction motor drives.	PO1, PO2
CO3	Analyze the Control of induction motor by Vector Control Method	PO1, PO2,PO3
CO4	Impart knowledge and analyze the control strategies of synchronous motor drives	PO1, PO2, PO3
CO5	Analyze the Control of various reluctance and BLDC motor drives	PO1, PO2, PO3

TEXT BOOKS

1. "Electric Motor Drives modeling - analysis and control" -1st Edition -2002 - R.Krishnan – Pearson Publication –NewDelhi

REFERENCES BOOKS

1. "Modern Power Electronics and AC drives"-1ST Edition -2001-B.K Bose-Pearson Publication -USA
2. "Power Electronic Control of AC motors"- 1st Edition-2005 -MD Murphy & FG Turn Bull Pergman Press– New York, USA,

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2.33**	-	-	-	-	-	-	-	-	-

M.TECH I-II SEM (PE)	DIGITAL CONTROL OF POWER ELECTRONICS	L	T	P	C
SUB CODE: 20MPE023	AND DRIVES	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To impart knowledge on motor control signal processors.
2. To impart knowledge on operation of peripherals of signal processors.
3. To impart knowledge on DSP based control of dc-dc converters.
4. To impart knowledge on DSP based control of matrix converters.
5. To impart knowledge on DSP based control of PMBLDC and SRM drives.

UNIT – I: MOTOR CONTROL SIGNAL PROCESSORS (9)

Introduction- Brief Introduction to Peripherals –Types of Physical Memory – The Components of the C2xx DSP Core –System configuration registers-Memory Addressing modes – Instruction set– Programming techniques – simple programs.

UNIT – II: PERIPHERALS OF SIGNAL PROCESSORS (9)

General purpose Input/output (GPIO) Functionality- Interrupts – A/D converter-Event Managers (EVA, EVB)- PWM signal generation.

UNIT – III: DSP-BASED CONTROL OF DC-DC CONVERTERS (9)

Introduction- Converter Structure-Continuous Conduction Mode, Discontinuous Conduction Mode- Connecting the DSP to the Buck-Boost Converter- Controlling the Buck-Boost Converter-Main Assembly Section Code Description Interrupt Service Routine. The regulation Code Sequences.

UNIT – IV: DSP-BASED CONTROL OF MATRIX CONVERTERS (9)

Space Vector Pulse Width Modulation- Principle of Constant V/Hz Control for Induction Motors- Space Vector PWM Technique- DSP Implementation- Introduction to matrix converter-Topology and Characteristics- Control Algorithms- Bidirectional Switch-Current Commutation – Overall Structure of 52 , Three-Phase Matrix Converter-Implementation of the Venturini Algorithm using the LF2407.

UNIT – V: DSP-BASED CONTROL OF PMBLDC AND SRM DRIVES (9)

Control of PMBLDC motor drives: Introduction-Principles of the BLDC Motor- Torque Generation –BLDC Motor Control System Implementation of the BLDC Motor Control System Using LF2407.Control of SRM drives: Introduction-Fundamentals of Operation-Fundamentals of Control in SRM Drives- Open Loop Control Strategy for Torque- Closed Loop Torque Control of the SRM Drive.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos related to Cos
CO1	Understand the concepts on DSP processor.	PO1,PO3,PO4
CO2	Analyze operation of peripherals of signal processors.	PO1,PO2,PO3,PO4
CO3	Analyze DSP based control of dc-dc converters.	PO1,PO2,PO3,PO4
CO4	Analyze DSP based control of matrix converters.	PO1,PO2,PO3,PO4, PO5
CO5	Analyze DSP based control of PMBLDC and SRM drives.	PO1,PO2,PO3,PO4

TEXT BOOKS:

1. Hamid A.Toliyat, Steven Campbell, *DSP based electromechanical motion control*, CRC Press, Special Indian Edition.

REFERENCE BOOKS:

1. R.Krishnan, Electric Motor Drives – Modeling, Analysis and Control, Prentice-Hall of India Pvt. Ltd., New Delhi, 2010

2. T.Kenjo and S.Nagamori, Permanent magnet and Brushless DC motors, Clarendon press, London, 1988.

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2		-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	2	2	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

M.TECH I-II SEM (PE) **MODERN POWER ELECTRONICS** **L T P C**
SUB CODE: 20MPE024 **3 0 0 3**

COURSE EDUCATIONAL OBJECTIVES:

1: To gain knowledge about different power semiconductor devices
2: To know the operation of resonant inverters
3: To know the concept of realization of ZCS and ZVS switching resonant converters
4: To understand the average model for half bridge and full bridge converter and design of controllers
5: To understand the concept of power supplies

UNIT - I: MODERN POWER SEMICONDUCTOR DEVICES (9)

Modern power semiconductor devices- MOS Turn Off Thyristor (MTO) – Emitter Turn Off Thyristor (ETO) – Integrated Gate – Commutated thyristor (IGCTs) – MOS – Controlled thyristors (MCTs) – Static induction Thyristors (SITHs) – Power integrated circuits (PICs) – Symbol - Structure and equivalent circuit- Comparison of their features.

UNIT - II: RESONANT PULSE INVERTERS (9)

Resonant pulse inverters – Series resonant inverters- Series resonant inverters with unidirectional switches – Series resonant inverters with bidirectional switches- – Analysis of half bridge and full bridge resonant inverter with bidirectional switches – Frequency response of series resonant inverter- series loaded inverter – parallel resonant inverters – Voltage control of resonant inverters.

UNIT – III: RESONANT PULSE CONVERTERS (9)

Resonant converters- Zero current switching resonant converters – L type ZCS resonant converter- M type ZCS resonant converter – Zero voltage Switching resonant converters – Comparison between ZCS and ZVS resonant converters- Two quadrant ZVS resonant converters – Resonant dc – Link inverters- Evaluation of L and C for zero current switching inverter.

UNIT - IV: DC POWER SUPPLIES (9)

DC power supplies – Classification- switched mode dc power supplies – Fly back Converter- Forward converter- Push –Pull converter – Half bridge converter –Full bridge converter – Resonant DC power supplies- Bidirectional power supplies- Application.

UNIT - V: AC POWER SUPPLES AND UNINTERRUPTIBLE POWER SUPPLIES (9)

AC power supplies – Classification – Switched mode ac power supplies Resonant AC power supplies-Bidirectional ac power supplies – Multistage conversions- Control circuits- Applications - Introduction- Power line disturbances – Power conditioners- Uninterruptible power supplies- Applications.

TOTAL: 45 HOURS

TEXT BOOKS:

1. "Power Electronics" - 3rd Edition - 2004 - Md.H.Rashid –Pearson Education –USA

REFERENCE BOOKS:

1. "Power Electronics: Converters, Applications" - 3nd Edition-2009 - N.Mohan - Tore.M.Undeland - W.P.Robbins –John Wiley &Sons – Singapore.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to Cos
CO1	To demonstrate knowledge onThe concepts of different power semiconductor devices	PO1,PO2,PO3
CO2	To Design switching resonant pulse Inverters	PO1,PO2,PO3
CO3	To Design aZCS and ZVS switching resonant converters	PO1,PO2, PO3
CO4	To Apply the conceptual knowledge of Half bridge and Full bridge converter	PO1,PO2,PO3,PO4
CO5	To identify the importance of different power supplies	PO1,PO2, PO3,PO12

CO-PO MAPPING:

PO-CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	3	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	3
CO*	**3**	**2**	**2**	**3**	-	-	-	-	-	-	-	**3**

M.TECH I-II SEM (PE)	ADVANCED POWER SEMICONDUCTOR	L	T	P	C
SUB CODE: 20MPE025A	DEVICES AND PROTECTION	3	0	0	3

(Core Elective-III)

COURSE EDUCATIONAL OBJECTIVES:

1. To provide knowledge about power transistors and MOSFETS.

2. To make the student understand the basic structure and characteristics of GTOS and IGBTS

3. To provide knowledge about IGBTS

4. To design passive components

5. To demonstrate protection of devices & circuits

UNIT I: BJTS AND MOSFETS (9)

Introduction- vertical power transistor structures-I-V characteristics-physics of BJT operation switching characteristics-break down voltages-second break down-on-state losses-safe operation areas design of drive circuits for BJTs-snubber circuits for BJTs and darlingtons.Introduction-basic structures-I-V characteristics-physics of device operation-switching characteristics-operation limitations and safe operating areas-design of gate drive circuits- snubber circuits

UNIT II: GTOS AND IGBTS (9)

Introduction-basic structures-I-V characteristics-physics of device operation-GTO switching characteristics-snubber circuits-over protection of GTOs. Introduction-basic structures-I-V characteristics-physics of device operation-Latch in IGBTs-switching characteristics-Device limits and safe operating areas-drive and snubber circuits.

UNIT III: EMERGING DEVICES AND CIRCUITS (9)

Introduction-Power junction field effect transistors-field controlled Thyristor-JFET based devices versus other power devices-MOS controlled Thyristors-high voltage integrated circuits-new semiconductor materials

UNIT IV: PASSIVE COMPONENTS AND ELECTROMAGNETIC COMPATIBILITY (9)

Introduction-design of inductor-transformer design-selection of capacitors-resistors current measurements-heat sinking circuit lay out –Electromagnetic Interference (EMI)-Sources of EMI-Electromagnetic Interference in Power Electronic Equipment. Noise sources in SMPS-Diode Storage Charge Noise-Noise generated due to switching-Common noises sources in SMPS-Noises Due to High frequency transformer-How they conducted noise is measured – minimizing EMI-EMI shielding-EMI standards.

UNIT-V: PROTECTION OF DEVICES & CIRCUITS **(9)**

Cooling & Heat sinks – Thermal modeling of power switching devices- snubber circuits – Reverse recovery transients – Supply and load side transients – voltage protections – current protections.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**Pos related to Cos**
CO1	Able to design of gate drive circuits-snubber circuits.	PO1,PO2,,PO3
CO2	Able to Identify safe operating areas of drives and snubber circuits	PO1,PO2,PO3
CO3	Able to understand the emerging devices and circuits	PO1,PO2,PO3
CO4	Able to identify noise sources, minimizing EMI	PO1,PO2,PO3
CO5	Capable to design protection devices.	PO1,PO3,PO4

TEXT BOOKS:

1. Power Electronics Circuits, Devices and Applications – M.H.Rashid-PHI-
2. Power Electronics –Converters, Applications and Design – Mohan and Undeland-John Wiley&Sons.

REFERENCE BOOKS:

1. Power Electronics Circuits-W.C. Lander
2. Power Electronics Circuits-Vithayathil

CO-PO MAPPING:

POCO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	3	-	-	-	-	-	-	-	-	-
CO2	3	2	3	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	3	-	-	-	-	-	-	-	-
CO*	3	2	2.5	3								

M.TECH I-II SEM (PE)	**ENERGY AUDITING – CONSERVATION**	**L**	**T**	**P**	**C**
SUB CODE: 20MPE025B	**AND MANAGEMENT**	**3**	**0**	**0**	**3**
	(Core Elective-III)				

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the basics of Energy Audit
2. To get knowledge on Energy Management
3. To gather information about energy efficient motors
4. To understand power factor improvement, lighting & energy instruments
5. To learn about Economic aspects and analysis and computation

UNIT – I: BASIC PRINCIPLES OF ENERGY AUDIT (9)

Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Pie charts – Sankey diagrams – Load profiles – Energy conservation schemes- Energy audit of industries-energy saving potential – Energy audit of process industry – Thermal power station – Building energy audit

UNIT – II: ENERGY MANAGEMENT (9)

Principles of energy management – Organizing energy management program – Initiating – Planning – Controlling – Promoting – Monitoring – Reporting – Energy manger – Qualities and functions – Language – Questionnaire – Check list for top management.

UNIT – III: ENERGY EFFICIENT MOTORS (9)

Energy efficient motors – Factors affecting efficiency – Loss distribution - Constructional details – Characteristics – Variable speed – Variable duty cycle systems – RMS hp- Voltage variation – Voltage unbalance – Over motoring – Motor energy audit

UNIT – IV: POWER FACTOR IMPROVEMENT - LIGHTING &ENERGY INSTRUMENTS (9)

Power factor – Methods of improvement – Location of capacitors – PF with non linear loads – Effect of harmonics on p.f. – PF motor controllers – Good lighting system design and practice – lighting control – Lighting energy audit. Energy Instruments watt meter – Data loggers – Thermocouples – Pyrometers – Lux meters – Tongue testers – Application of PLC's.

UNIT – V: ECONOMIC ASPECTS AND ANALYSIS – COMPUTATION (9)

Economics Analysis – Depreciation Methods - Time value of money - Rate of return - Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors. Calculation of simple payback method – Net present worth method – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, students will have		Pos related to Cos
CO1	Ability to explain the basics of Energy Audit	PO1,PO2,PO3,PO6,PO7,PO12
CO2	Able to know about Energy Management	PO1,PO2
CO3	Able to gain the basic knowledge on energy efficient motors	PO1,PO2
CO4	Ability to attain knowledge on power factor improvement, lighting & energy instruments	PO1,PO2
CO5	Able to understand Economic aspects and analysis and computation	PO1,PO2

TEXT BOOKS:

1. "Energy management" – 1st Edition – 2007- by W.R. Murphy & G. Mckay Butter worth Heinemann publications-New Delhi.
2. "Energy management" – 1st edition – 1998 – by Paul o' Callaghan – Mc-graw Hill Book company- New Delhi.

REFERENCE BOOKS:

1. "Energy efficient electric motors" – 2nd edition – 1995 – by John C. Andreas – Marcel Dekker Inc Ltd
2. "Energy management hand book" – 2nd edition-1992- by W.C.Turner – john Wiley and sons – New York.

CO-PO MAPPING:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	2	2	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	3	2	2	-	-	2	2	-	-	-	-	2

M.TECH I-II SEM (PE)	OPTIMAL CONTROL THEORY	L	T	P	C
SUB CODE: 20MPE025C	(Core Elective-III)	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1	To impart knowledge on optimal control, and state space process models
2	To impart knowledge on calculus of variations, Euler method, fixed point method
3	To impart knowledge on calculus of variations with several independent functions.
4	To impart knowledge Hamiltonian function and Pontryagin‟s minimum principle to solve optimal control problem using variation approach
5	To understand the concept of Dynamic programming and know the computational procedure for solving optimal control problems

UNIT I: INTRODUCTION **(9)**

The Mathematical Modelofa Process, Physical Constraints. The Performance Measure , the Optimal Control Problem , Forms of the Optimal Control, State Variable Representation of System – System Classification and Output Equations , Solution of State Equation – Linear Systems, Typical Control Problems, Selection of Performance Measure , Controllability and Observability.

UNIT II THE CALCULUS OF VARIATIONS – I: **(9)**

Fundamental Concepts, Maxima and Minima of Functions, Fundamental Theorem of Calculus of Variations. Functional of Single Function, The Simplest Variation Problem- Euler‟s Equation, Fixed End Point Problem- Free End Point Problem.

UNIT III THE CALCULUS OF VARIATIONS – II **(9)**

Functional Involving Several Independent Functions – Problem with Fixed End Points – Problems with Free End Points, Constrained Extrema- Constrained Minimization of Function and Functional.

UNIT IV VARIATIONAL APPROACH TO OPTIMALCONTROL PROBLEMS: **(9)**

Necessary Conditions for Optimal Control Hamaltonian Function- Boundary Conditions in Optimal Control Problems – Linear Regulator Problems – Matrix Ricalti Equation – Linear Tracking Problem.

PONTRYAGIN'S MINIMUM PRINCIPLE:

State un Equality Constraints – Minimum Time Problem- Minimum Control Effort Problem- Minimum Fuel Problem – Minimum Energy Problem.

UNIT V DYNAMIC PROGRAMMING: **(9)**

The Optimal Control Law, The principal of Optimality, Dynamic Programming applied to Routing Problems, An Optimal Control Systems-A recurrence Relation of Dynamic Programming – Computational Procedure for Solving Optimal Control Problems –Discrete Linear Regulator Problems, Hamilton – Jacobian- Bellman Equation- Continuous Linear Regulator Problems.
numerical determination of optimal trajectories: Two-Point Boundary-Value Problem- Method of Steepest Descent –Steepest Descent Algorithm.

TOTAL: 45 HOURS

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos related to Cos
CO1	Select the performance measure for typical control problems and apply state space model in solving linear system.	PO1,PO3,PO4
CO2	Apply Euler‟s equation for solving optimal control problems having	PO1,PO2,PO3,PO4
CO3	Apply calculus variations for single function and involving several independent functions..	PO1,PO2,PO3,PO4
CO4	Solve several optimal control problems using Hamiltonian function and Pontryagin‟s minimum principle.	PO1,PO2,PO3,PO4, PO5
CO5	Apply Dynamic programming to solve nonlinear problems.	PO1,PO2,PO3,PO4

TEXT BOOKS:

1. Donald E. Krik:Optimal Control Theory, Library of Congress Cataloging in Publication Data.
2. M.Gopal:Modern Control Systems Theory, New age International Publishers, 5th Edition, 1984

REFERENCES BOOKS:

1.A.P.Sage:Optimal System Control, Pearson Education Canada, 1977.
2. Ogata:Modern Control Systems Theory, Prentice Hall, 2010.

CO-PO MAPPING

CO- PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	2	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	2	2	2	2	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	3	2	2	2	2	-	-	-	-	-	-	-

M.TECH I-II SEM (PE)	PROGRAMMABLE LOGIC CONTROLLERS	L	T	P	C
SUB CODE: 20MPE025D	(Core Elective-III)	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the basics of PLC
2. To get knowledge on digital logic gates, 41oolean algebra and ladder diagram
3. To learn about PLC registers
4. To know the concept of Data Handling functions
5. To provide knowledge on Analog PLC operation

Unit – 1: PLC BASICS **(9)**

PLC system – I/O modules and interfacing – CPU processor – Programming equipment – Programming formats – Construction of PLC ladder diagrams – Devices connected to I/O modules – PLC programming: Input instructions – Outputs – Operational procedures – Programming examples using contacts and coils – Drill press operation .

Unit – 2: DIGITAL LOGIC GATES **(9)**

Digital logic gates – Programming in the Boolean algebra system – Conversion examples – Ladder diagrams for process control: Ladder diagrams and sequence listings – Ladder diagram constructions and flow charts for spray process system.

Unit – 3: PLC REGISTERS **(9)**

Characteristics of registers module addressing – Holding registers – Input registers – Output registers. PLC functions: Timer functions and industrial applications – Counters – counter function industrial applications – Arithmetic functions – Number comparison.

Unit – 4: DATA HANDLING FUNCTIONS **(9)**

SKIP – Master control relay – Jump – Move – FIFO – FAL - ONS - CLR and SWEEP functions and their applications. Bit pattern and changing a bit shift register – Sequence functions and applications – Controlling of two axis and three axis robots with PLC – Matrix functions.

Unit – 5: ANALOG PLC OPERATION **(9)**

Analog modules and 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.

TOTAL: 45 HOU

COURSE OUTCOMES:

On successful completion of the course, students will have		Pos related to Cos
CO1	Ability to understand the basics of PLC	PO1,PO2
CO2	Able to write programs using 42oolean algebra and draw ladder diagram	PO1,PO2,PO3,PO5,P O7
CO3	Ability to learn about PLC registers	PO1,PO2,PO3,PO5,P O7
CO4	Ability to write programs using Data Handling functions	PO1,PO2,PO3,PO5,P O7
CO5	Able to get knowledge on Analog PLC operation	PO1,PO2,PO5,PO7

TEXT BOOK:

1. "Programmable logic controllers-Principle and applications"- fifth edition 1999 by John W.Webb and Ronald A.Reiss – PHI-New Delhi.

REFERENCE BOOK:

1. "Programmable logic controllers- Programming Method and applications" – 1st edition 2004by Jr Hackworth and F.D Hackworth Jr.- Prentice Hall-New Delhi.

CO-PO MAPPING

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	2	-	3	-	-	-	-	-
CO3	3	2	2	-	2	-	3	-	-	-	-	-
CO4	3	2	2	-	2	-	3	-	-	-	-	-
CO5	3	2	-	-	-	-	3	-	-	-	-	-
CO*	3	2	2	-	2	-	3	-	-	-	-	-

M.TECH I-II SEM (PE)	POWER ELECTRONIC APPLICATIONS TO POWER SYSTEMS	L	T	P	C
SUB CODE: 20MPE026A	(Core Elective-III)	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1: To demonstrate knowledge on uncompensated lines and their behavior under heavy loading conditions

2: To impart knowledge on concept and importance controllable parameters of FACTS controllers like Shunt compensation, SVC and STATCOM.

3: To impart knowledge on series Compensators and SSSC

4: To demonstrate knowledge combined compensator like UPFC

5: To impart knowledge mitigation of Harmonics and power quality problems

UNIT I: GENERAL SYSTEM CONSIDERATIONS AND FACTS (9)

Transmission Interconnections, Flow of Power in an AC System, Power Flow and Dynamic Stability Considerations of a Transmission interconnection, principles of series and shunt compensation, Basic Types of FACTS Controllers, Benefits from FACTS, Application of FACTS.

UNIT II: SHUNT COMPENSATORS (9)

Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, improvement of Transient Stability, Power Oscillation Damping, Static Var Compensators, SVC and STATCOM, The Regulation Slope, Transfer Function and dynamic Performance, Transient Stability, Enhancement and Power Oscillation Damping.

UNIT III: SERIES COMPENSATORS (9)

Objectives of Series Compensation, concept of series capacitive compensation, voltage stability, improvement of transient stability, power oscillation damping, GTO thyristor controlled series capacitor, Thyristors controlled series capacitor, SSSC.

UNIT IV: COMBINED COMPENSATORS (9)

Introduction, Unified power flow controller, basic operating principles, independent real and reactive power flow control, and control structure, basic control system for P and Q control. **UNIT**

UNIT V: MITIGATION OF HARMONICS (9)

Power quality problems, harmonics, harmonic creating loads, harmonic power flow, and mitigation of harmonics, filters, passive filters, active filters, shunt, series and hybrid filters

TOTAL: 45 HOUR

COURSE OUTCOMES:

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

Course Outcomes		POs related to Cos
CO1	Demonstrate knowledge on uncompensated lines and their behavior under heavy loading conditions	PO1, PO2
CO2	Demonstrate knowledge on concept and importance controllable parameters of FACTS controllers like Shunt and series Compensators	PO1, PO2
CO3	Demonstrate knowledge and analyze series Compensators and SSSC	PO1, PO2
CO4	Demonstrate knowledge and analyze combined compensator like UPFC	PO1, PO2, PO3
CO5	Apply FACTS controllers for mitigation of Harmonics and power quality problems	PO1, PO2, PO3, PO5

TEXT BOOKS:

1. "Understanding FACTS", Narain G.Hingorani, LaszloGyugyi, IEEE press.

REFERENCES BOOKS:

1. "Electrical Power Systems Quality", Roger.C. Dugan, Mark.F. McGranagham, SuryaSantoso, H.Wayne Beaty, McGrawHill,2003.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	2	-	-	-	-	-	-	-
CO*	**3**	**2.4**	**2**	-	**2**	-	-	-	-	-	-	-

M.TECH I-II SEM (PE)	ADVANCED DRIVES & CONTROL	L	T	P	C
SUB CODE: 20MPE026B	(Core Elective-III)	3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1: To demonstrate knowledge on scalar control of ac motor and corresponding speed torque characteristics
2: To impart knowledge on vector control of ac motor drives
3: To demonstrate knowledge on static resistance control and Slip power recovery schemes.
4: To impart knowledge on synchronous motor drive characteristics and its control strategies
5: To demonstrate knowledge on brushless dc motor principle of operation and control schemes

UNIT-I: INDUCTION MOTOR- AN OVERVIEW (9)

Review of Steady-State Operation of Induction Motor, Equivalent Circuit Analysis, TorqueSpeed Characteristics. Phase Controlled Induction Motor Drive, Stator Voltage Control of Induction Motor, Phase-Controlled Converter Fed Induction Motor, Power Circuit and Gating, ReversiblePhase-ControlledInductionMotorDrive,Torque-SpeedCharacteristics.

UNIT-II: VOLTAGE SOURCE INVERTER FED INDUCTION MOTOR DRIVE (9)

Stator Voltage and Frequency Control of Induction Motor, Torque-Speed Characteristic Static Frequency Changers, PWM Inverter Fed Induction Motor Drive, Variable-Voltage Variable Frequency Operation of Induction Motor, Constant E/f And V/f Control Schemes, Slip Regulation. Current Source Inverter Fed Induction Motor Drive, Stator Current and Frequency Control of Induction Motor, Auto Sequentially Commutated Inverter (ASCI), Power Circuit, commutation, Phase Sequence Reversal, Regeneration, Steady-State Performance.

UNIT-III: ROTOR SIDE CONTROL OF SLIP-RING INDUCTION MOTOR (9)

Slip-Power Recovery Schemes, Steady-State Analysis- Range of Slip, Equivalent Circuit, Performance Characteristics; Rating of Converters. Vector Control of Induction Motor, Principles of Vector Control, Direct Vector Control, Derivation of Indirect Vector Control, Implementation–Block Diagram, Estimation of Flux, Flux Weakening Operation.

UNIT-IV: CONTROL OF SYNCHRONOUS MOTOR DRIVES (9)

Synchronous Motor and Its Characteristics- Control Strategies-Constant Torque Angle Control Power Factor Control, Constant Flux Control, Flux Weakening Operation, Load Commutated Inverter Fed Synchronous Motor Drive, Motoring and Regeneration, Phasor Diagrams.

Unit-V: PMSM AND BLDC DRIVES **(9)**

Characteristics of Permanent Magnet, Synchronous Machines With Permanent Magnet, Vector Control of PMSM-Motor Model and Control Scheme, Constant Torque Angle Control, Constant Mutual Flux Linkages, Unity PF Control. Modeling of PM Brushless Dc Motor, Drive Scheme, Commutation Torque Ripple, Phase Advancing.

TOTAL: 45 HOUR

Course Outcomes:

On successful completion of the course the student will be able to		POs related to COs
CO1	Demonstrate knowledge on scalar control of ac motor and corresponding speed torque characteristics	PO1, PO2
CO2	Demonstrate knowledge on vector control of ac motor drives	PO1, PO2
CO3	Demonstrate knowledge on static resistance control and Slip power recovery schemes.	PO1, PO2
CO4	Demonstrate knowledge on synchronous motor drive characteristics and its control strategies	PO1, PO2, PO3
CO5	Demonstrate knowledge on brushless dc motor principle of operation and control schemes	PO1, PO2, PO3

TEXT BOOK:

1. "Power Electronics and motor control" – II Edn - Shepherd - Hulley - Liang –- CU Press- New York
2. "Electric motor drives modeling" - Analysis and control – I Edn -2002- R. Krishnan –-PHI- New Delhi.

REFERENCES:

1. "Power Electronic Circuits, Devices and Applications" – 3rd Edn- 2005 - M.H.Rashid–PHI - New Delhi.
2. "Fundamentals of Electric Drives" –2009- G. K. Dubey – Narosa Publications – New Delhi.

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2**	-	-	-	-	-	-	-	-	-

M.TECH I-II SEM (C.E-IV) **INTELLIGENT CONTROL TECHNIQUES** **L T P C**
SUB CODE: 20MPE026C **(Core Elective-III)** **3 0 0 3**

COURSE EDUCATIONAL OBJECTIVES:

The student will be able to:
1. Learn about basic concepts of AI
2. Understand concepts of ANN and various learning algorithms
3. Learn about Genetic Algorithm, ACO and Tabu search concepts
4. Understand the concepts of Fuzzy
5. Learn about Fuzzy logic controller and design using MATLAB

UNIT I: ARTIFICIAL INTELLIGENT **(9)**
Introduction to control techniques, need of intelligent control. Architecture for intelligent control. Symbolic reasoning system, rule - based systems, the AI approach. Knowledge representation. Expert systems. Data Pre - Processing: Scaling, Fourier transformation, principal - component analysis and wavelet transformations.

UNIT II: ARTIFICIAL NEURAL NETWORKS **(9)**
Concept of Artificial Neural Networks and its basic mathematical model, McCulloch - Pitts neuron model, simple perceptron, Adaline and Madaline, Feed - forward Multilayer Perceptron. Learning and Training the neural network. Networks: Hopfield network, Self - organizing network and Recurrent network. Neural Network based controller, Case studies: Identification and control of linear and nonlinear dynamic systems using Matlab / Neural Network toolbox.

UNIT III: GENETIC ALGORITHM, ACO AND TABU **(9)**
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 than GA search techniques like tabu search and ant - colony search techniques for solving optimization problems.

UNIT IV: INTRODUCTION TO FUZZY **(9)**
Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning. Introduction to Fuzzy logic modeling and control of a system. Fuzzification, inference and defuzzification. Fuzzy knowledge and rule bases.

UNIT V: MODELING OF FUZZY LOGIC CONTROLLER **(9)**
Fuzzy modeling and control schemes for nonlinear systems. Self - organizing fuzzy logic control. Implementation of fuzzy logic controller using Matlab fuzzy - logic toolbox. Stability analysis of fuzzy control systems. Intelligent Control for SISO/MIMO Nonlinear Systems. Model Based Multivariable Fuzzy Controller.

TOTAL: 45 HOUR

COURSE OUTCOME

On successful completion of the course, students will be able to		POs related to COs
CO1	Learn about basic concepts of AI	PO1,PO4, PO5, PO11,PO12
CO2	Understand concepts of ANN and various learning algorithms.	PO1,PO4, PO5,PO6 PO11,PO12
CO3	Learn about Genetic Algorithm, ACO and Tabu search concepts	PO1,PO4, PO5, PO11,PO12
CO4	Understand the concepts of Fuzzy	PO1,PO4, PO5, PO11,PO12
CO5	Learn about Fuzzy logic controller and design using MATLAB	PO1,PO4, PO5,PO6 PO11,PO12

TEXT BOOKS:

1. Simon Haykins, Neural Networks: A comprehensive Foundation, Pearson Edition, 2003.
2. T.J.Ross, Fuzzy logic with Fuzzy Applications, Mc Graw Hill Inc, 1997.
3. David E Goldberg, Genetic Algorithms.

REFERENCES BOOKS:

1. M.T.Hagan, H. B. Demuth and M. Beale, Neural Network Design, Indian reprint, 2008.
2. Fredric M.Ham and Ivica Kostanic, Principles of Neurocomputing for science and Engineering,McGraw Hill, 2001.
3. N.K. Bose and P.Liang, Neural Network Fundamentals with Graphs, Algorithms and Applications, Mc - Graw Hill, Inc. 1996.
4. Yung C. Shin and Chengying Xu, Intelligent System - Modeling, Optimization and Control, CRC Press, 2009.

CO-PO MAPPING:

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	3	3	-	-	-	-	-	2	2
CO2	3	-	-	3	3	2	-	-	-	-	2	2
CO3	3	-	-	3	3	-	-	-	-	-	2	2
CO4	3	-	-	3	3	-	-	-	-	-	2	2
CO5	3	-	-	3	3	2	-	-	-	-	2	2
CO*	**3**			**3**	**3**	**2**					**2**	**2**

M.TECH I-II SEM (C.E-IV) **INTRODUCTION TO EMBEDDED SYSTEMS** **L T P C**
SUB CODE: 20MPE026D **(Core Elective-III)** **3 0 0 3**

COURSE EDUCATIONAL OBJECTIVES:

1: To provide knowledge about Embedded System
2: To make the student understand the Memory Organization
3: To provide knowledge about Embedded Networks
4: To design Modeling Concepts
5: To know the concept of Embedded system design.

UNIT I: INTRODUCTION **(9)**

Embedded System –Types of Embedded System – Requirements of Embedded System – Issues in Embedded software development – Applications

UNIT II: PROCESSOR & MEMORY ORGANIZATION **(9)**

Processor & Memory Organization: Structural units in processor – Processor selection – Memory devices – Memory selection – Memory Allocation & Map –Interfacing.

UNIT III: EMBEDDED NETWORKS **(9)**

Devices – Device Drives & Buses for Device Networks: I/O devices – Timers & 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: PROGRAM MODELING CONCEPTS **(9)**

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 **(9)**

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.

TOTAL: 45 HOUR

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**Pos related to Cos**
CO1	Knowledge about Embedded System.	PO1, PO3
CO2	Identify operating areas of Memory Organization	PO1, PO3
CO3	Understand the Embedded Networks	PO1,PO2,PO3
CO4	Identify the Modeling Concepts.	PO1,PO2,PO3
CO5	know the concept of Embedded system design	PO1,PO3

TEXT BOOKS:

1. Introduction to Embedded Systems : Shibu K. V. (TMH)
2. Embedded System Design – A unified hardware and software introduction: F. Vahid (John Wiley)
3. Embedded Systems : Rajkamal (TMH)
4. Embedded Systems : L. B. Das (Pearson).

REFERENCE BOOKS

1. Embedded System design : S. Heath (Elsevier)
2. Embedded microcontroller and processor design: G. Osborn (Pearson)
3. Embedded Systems: Frank Vahid , Wiley India, 2002
4. Embedded Microcomputer Systems – Real Time Interfacing – Jonathan W. Valvano; Cengage Learning; Third or later edition

CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	2	-	-	-	-	-	-	-	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	-	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**	-	-	-	-	-	-	-	-	-

M.TECH I-II SEM (PE)	POWER CONVERTERS LAB -II	L	T	P	C
SUB CODE: 20MPE027		0	0	4	2

COURSE EDUCATIONAL OBJECTIVES:

1: To demonstrate knowledge on different power electronic inverters.

2: To analyze the performance of Controlled inverters.

3: To impart knowledge and analyze the performance characteristics of AC drive.

4: To determine various parameters of AC drives in closed loop control.

5: To evaluate the performance and efficiency of AC drives in closed loop control

Conduct Any TEN of the following:

List of Experiments:-

1. SINGLE PHASE INVERTER WITH PWM CONTROL.

2. TWO-LEVEL AND THREE-LEVEL INVERTER WITH SINUSOIDAL PWM.

3. SPEED CONTROL OF A SINGLE PHASE INDUCTION MOTOR

4. SPEED CONTROL OF A UNIVERSAL MOTOR

5. CYCLO-CONVERTER BASED AC INDUCTION MOTOR CONTROL UNIT.

6. SPEED CONTROL OF THREE PHASE WOUND ROTOR INDUCTION MOTOR

7. V/F CONTROL OF THREE-PHASE INDUCTION MOTOR

8. SPEED CONTROL OF PM SYNCHRONOUS MOTOR BY VOLTAGE CONTROL METHOD

9. SPEED CONTROL OF SWITCHED RELUCTANCE MOTOR WITH EDDY CURRENT LOADS .

10. SPEED CONTROL OF SINGLE PHASE INDUCTION MOTOR USING IGBT BASED PWM INVERTER.

11. DETERMINATION OF SPEED AND OUTPUT VOLTAGE OF 3-PHASE A.C. VOLTAGE CONTROLLER FED INDUCTION MOTOR DRIVE

12. OUTPUT VOLTAGE CHARACTERISTICS OF FLYING CAPACITORS MULTI- LEVEL INVERTER- FED INDUCTION MOTOR DRIVE

13. SPEED CONTROL OF BLDC MOTOR.

14. SPEED CONTROL OF 3 PHASE INDUCTION MOTOR WITH DSP BASED V/F TECHNIQUE.

COURSE OUTCOMES:

On successful completion of the course, student will be able to		POs related to Cos
CO1	Demonstrate knowledge on different power electronic inverters	PO1
CO2	Analyze the performance of Controlled converters and characteristics of AC drives.	PO2
CO3	Select appropriate design tools and procedure to evaluate performance of AC drives.	PO4
CO4	Apply control schemes to determine various parameters of AC drives in Closed loop control.	PO5
CO5	Follow ethical principles to evaluate performance of AC drives.	PO8
CO6	Do experiments effectively as an individual and as a member in a group.	PO9
CO7	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO8	Continue updating their skill related to various testing of AC drives during their life time	PO12

CO-PO MAPPING

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

M.TECH I-II SEM (PE)	ELECTRICAL SYSTEMS SIMULATION LAB	L	T	P	C
SUB CODE: 20MPE028		-	-	4	2

COURSE EDUCATIONAL OBJECTIVES:

1: To demonstrate knowledge on simulation of different power electronic converters.

2: To analyze the performance of Controlled rectifiers.

3: To impart knowledge simulation and analysis the performance characteristics of DC drive.

4: To determine various parameters of DC and AC drives in closed loop control.

5: To evaluate the performance by Simulation of DC and AC drives.

Conduct any TEN of the following:

List of Experiments:-

1. SIMULATION OF 1-PHASE IGBT BASED BRIDGE INVERTER CIRCUITS WITH R - R-L LOADS.
2. SIMULATION OF 3-PHASE BRIDGE INVERTER.
3. SIMULATION OF 1-PHASE THYRISTORIZED CONVERTERS (SEMI - FULL CONVERTER).
4. SIMULATION OF 3-PHASE BRIDGE CONVERTER.
5. SIMULATION OF SPEED CONTROL OF SEPARATELY EXITED DC MOTOR.
6. SIMULATION OF CLOSED LOOP SPEED CONTROL OF BLDC MOTOR.
7. SIMULATION OF DC-DC CONVERTERS (BUCK - BOOST - BUCK-BOOST CONVERTERS)
8. SIMULATION OF TWO-LEVEL AND THREE-LEVEL INVERTER WITH SINUSOIDAL PWM.
9. SIMULATION OF VSI FED INDUCTION MOTOR (SQUARE WAVE AND PWM INVERTERS).
10. SIMULATION OF INDUCTION MOTOR WITH OPEN LOOP CONSTANT V/F CONTROL.
11. SIMULATION OF INDUCTION MOTOR WITH INDIRECT VECTOR CONTROL.
12. SIMULATION OF SINGLE PHASE VSI FED RL/RC LOAD.
13. SIMULATION OF SINGLE PHASE CSI FED INDUCTION HEATING LOAD.
14. SIMULATION OF MULTI LEVEL INVERTER TOPOLOGIE

Course Outcomes:

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

Course Outcomes		POs related to COs
CO1	Demonstrate knowledge on simulation of different power electronic converters.	PO1
CO2	Analyze the performance of Controlled rectifiers, DC and AC drives.	PO2
CO3	Design and simulate the various control schemes for converters and drives.	PO3
CO4	Select appropriate design tools and procedure to evaluate performance of DC and AC drives.	PO4
CO5	Apply control schemes to determine various parameters of DC and AC drives in closed loop control.	PO5
CO6	Follow ethical principles to evaluate performance of electrical drives.	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to various testing of electrical drives during their life time	PO12

CO-PO Mapping

PO / CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

M.TECH I-II SEM (PE)	MOOC OPEN ELECTIVE COURSES	L T P C - - - 2

i. The CBCS, also called as Open Electives (OEs) will be implemented in the college. The CBCS provides choice for students to select from the prescribed courses. In which students can take courses of their choice, learn at their own pace and adopt an interdisciplinary approach to learning.

ii. The college in line with the developments in Learning Management Systems (LMS) intends to encourage the students to do online courses in MOOCs, offered nationally / internationally. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion of the course from the MOOCs providers.

iii. Institution intends to encourage the students to do one MOOC in II year I Semester of the M.Tech. Programme. The respective departments shall give a list of standard MOOCs providers among NPTEL, edx, Udacity, Coursera, or any other standard providers, whose credentials are endorsed by the HoD. Each department shall appoint Coordinators / Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.

iv. A student shall choose an online open elective course, except his / her program of study from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.

v. Students may be permitted to register one online course (which is provided with certificate) in II year I semester and they should produce the course completion certificate of that course to the controller of Examination to become eligible for fulfillment of the degree before the end of II year II semester of their study.

M.TECH I-II SEM (PE) | **L T P C**

SUB CODE: 20MPE031 | **PROJECT WORK (PHASE-I)** | **0 0 0 10**

COURSE EDUCATIONAL OBJECTIVES:

1. Discovering potential research areas in the field of **Power Electronics** Design Concepts.
2. Comparing and contrast the several existing solutions for the problem identified.
3. Formulating and propose a plan for creating a solution for the research plan identified.
4. Conducting the experiments as a team and interpret the results.
5. Reporting and presenting the findings of the work conducted.

The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design / fabrication / analysis for a specific application, a research project with a focus on an application needed by the industry / society, a computer project, a management project or a design and analysis project. A project topic must be selected by the student in consultation with their guides.

A candidate may, however, in certain cases, be permitted to work on projects in an Industrial/Research Organization, on the recommendations of the Head of the Department Concerned. In such cases, the Project work shall be jointly supervised by a supervisor of the department and an expert, as a joint supervisor from the organization and the student shall be instructed to meet the supervisor periodically and to attend the review committee meetings for evaluating the progress.

Project Work for Phase-I, there will be a Viva-voce Examination during End of the Semester conducted by a Committee consisting of the supervisor, two internal examiners (Preferably one Senior Teacher and Head of the Department).

The evaluation of Project Work for Phase-I shall be done independently in the respective semesters and marks shall be allotted as per the weightages given below.

<table>
<tr><th colspan="7">Phase II</th></tr>
<tr><th colspan="3">Internal Assessment (40 Marks)</th><th colspan="4">End Semester Examination (60 Marks)</th></tr>
<tr><td rowspan="2">Review - I</td><td rowspan="2">Review - II</td><td rowspan="2">Review - III</td><td colspan="4">Project Work Phase II Viva–voce (60 Marks)</td></tr>
<tr><td>Thesis Submission (External Examiner)</td><td>Supervisor Examiner</td><td>Internal Examiner</td><td>External Examiner</td></tr>
<tr><td>10</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td></tr>
</table>

Students are encouraged to go to Industrial Project / Internship for at least 2-3 months.

COURSE EDUCATIONAL OBJECTIVES:

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

1. Demonstrate capacity to identify an advanced topic for seminar in core and allied areas.
2. Extract information pertinent to the topic through literature survey.
3. Comprehend the extracted information through analysis and synthesis critically on the topic.
4. Contribute to multidisciplinary scientific work in the field of Power systems.
5. Manage time and resources effectively and efficiently.
6. Plan, organize, prepare and present effective written and oral technical report on the topic.
7. Engage in lifelong learning for development of technical competence in the field of PowerSystems.
8. understand ethical responsibility towards environment and society in the field of Electrical
9. Adapt to independent and reflective learning for sustainable professional growth in Electricalpower systems.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Demonstrate capacity to identify an advanced topic for seminar in core and allied areas.	PO1,PO2,PO3
CO2	Extract information pertinent to the topic through literature survey.	PO1,PO2,PO3,PO4, PO5
CO3	Comprehend the extracted information through analysis and synthesis critically on the topic.	PO1,PO2,PO3,PO12
CO4	Contribute to multidisciplinary scientific work in the field of Power Electronics.	PO1,PO2,PO5
CO5	Manage time and resources effectively and efficiently.	PO1,PO2,PO3,PO12
CO6	Plan, organize, prepare and present effective written and oral technical report on the topic.	PO1,PO2,PO3,PO12
CO7	Engage in lifelong learning for development of technical competence in the field of Power Electronics.	PO1,PO2,PO3,PO12
CO8	understand ethical responsibility towards environment and society in the field of Electrical	PO1,PO2,PO3,PO12
CO9	Adapt to independent and reflective learning for sustainable professional growth in Power Electronics.	PO1,PO2,PO3,PO12

CO-PO MAPPING

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	2
CO4	3	3	-	-	-	3	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	2
CO6	3	3	2	-	-	-	-	-	-	-	-	2
CO7	3	3	2	-	-	-	-	-	-	-	-	2
CO8	3	3	2	-	-	-	-	-	-	-	-	2
CO9	3	3	2	-	-	-	-	-	-	-	-	2
CO*	**3**	**3**	**2**	**3**	**3**	**3**						**2**

M.TECH I-II SEM (PE) | **L T P C**

SUB CODE: 20MPE041 **PROJECT WORK (PHASE-II)** | **0 0 0 14**

COURSE EDUCATIONAL OBJECTIVES:

1. Discovering potential research areas in the field of Power Electronic Design Concepts.
2. Comparing and contrast the several existing solutions for the problem identified.
3. Formulating and propose a plan for creating a solution for the research plan identified.
4. Conducting the experiments as a team and interpret the results.
5. Reporting and presenting the findings of the work conducted.

The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design / fabrication / analysis for a specific application, a research project with a focus on an application needed by the industry / society, a computer project, a management project or a design and analysis project. A project topic must be selected by the students in consultation with their guides.

The Project work (Phase II) shall be pursued for a minimum of 16 weeks during the final semester. A candidate may, however, in certain cases, be permitted to work on projects in an Industrial/Research Organization, on the recommendations of the Head of the Department Concerned. In such cases, the Project work shall be jointly supervised by a supervisor of the department and an expert, as a joint supervisor from the organization and the student shall be instructed to meet the supervisor periodically and to attend the review committee meetings for evaluating the progress.

Project Work for Phase-II, there will be a Viva-voce Examination during End Semester Examinations conducted by a Committee consisting of the supervisor, one internal examiner and one external examiner.

The evaluation of Project Work for Phase-II shall be done independently in the respective semesters and marks shall be allotted as per the weightages given below.

Phase II						
Internal Assessment (40 Marks)			**End Semester Examination (60 Marks)**			
Review - I	Review - II	Review - III	Project Work Phase II Viva–voce(60 Marks)			
			Thesis Submission (External Examiner)	Supervisor Examiner	Internal Examiner	External Examiner
10	**15**	**15**	**15**	**15**	**15**	**15**

Students are encouraged to go to Industrial Project / Internship for at least 2-3 months.

COURSE OUTCOMES:

On successful completion of course, the student will be able to		POs related to COs
CO1	Demonstrate in-depth knowledge on the project topic	**PO1**
CO2	Identify, analyze and formulate complex problem chosen for project work to attain substantiated conclusions.	**PO2**
CO3	Design solutions to the chosen project problem.	**PO3**
CO4	Undertake investigation of project problem to provide valid conclusions	**PO4**
CO5	Use the appropriate techniques, resources and modern engineering tools necessary for project work	**PO5**
CO6	Apply project results for sustainable development of the society.	**PO6**
CO7	Understand the impact of project results in the context of environmental sustainability.	**PO7**
CO8	Understand professional and ethical responsibilities while executing the project work.	**PO8**
CO9	Function effectively as individual and a member in the project team	**PO9**
CO10	Develop communication skills, both oral and written for preparing and presenting project report.	**PO10**
CO11	Demonstrate knowledge and understanding of cost and time analysis required for carrying out the project.	**PO11**
CO12	Engage in lifelong learning to improve knowledge and competence in the chosen area of the project.	**PO12**

CO-POMAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	-
CO7	-	-	-	-	-	-	3	-	-	-	-	-
CO8	-	-	-	-	-	-	-	3	-	-	-	-
CO9	-	-	-	-	-	-	-	-	3	-	-	-
CO10	-	-	-	-	-	-	-	-	-	3	-	-
CO11	-	-	-	-	-	-	-	-	-	-	3	-
CO12	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**