

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC and ISO 9001:2015 Certified

Shamshabad - 501 218, Hyderabad, Telangana State, India.

www.vardhaman.org

MASTER OF TECHNOLOGY POWER ELECTRONICS AND ELECTRICAL DRIVES

**ACADEMIC REGULATIONS
COURSE STRUCTURE (VCE-R18)**

CHOICE BASED CREDIT SYSTEM

(For batches admitted from the Academic Year 2018 - 2019)

Note: The regulations hereunder are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program) as may be decided by the Academic Council.



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PRELIMINARY DEFINITIONS AND NOMENCLATURES

- ❖ “Autonomous Institution / College” means an institution / college designated as autonomous institute / college by University Grants Commission (UGC), as per the UGC Autonomous College Statutes.
- ❖ “Academic Autonomy” means freedom to a College in all aspects of conducting its academic programs, granted by the University for promoting excellence.
- ❖ “Commission” means University Grants Commission.
- ❖ “AICTE” means All India Council for Technical Education.
- ❖ “University” means Jawaharlal Nehru Technological University Hyderabad.
- ❖ “College” means Vardhaman College of Engineering, Hyderabad unless indicated otherwise by the context.
- ❖ “Program” means:
 - Master of Technology (M. Tech.) Degree program
 - PG Degree Program: M. Tech
- ❖ “Branch” means specialization in a program like M. Tech. program in Structural Engineering, M. Tech. program in Computer Science and Engineering etc.
- ❖ “Course” or “Subject” means a theory or practical subject, identified by its course – number and course-title, which is normally studied in a semester. For example, B4911English for Research Papers Writing, means a theory or practical subject, identified by its course-number and course-title, which is normally studied in a semester. The description of allocation of course code is mentioned in the table 1.

Table 1: Course Code Description

First Digit	Second Digit	Third Digit	Fourth and Fifth Digit
Indicates Program	Indicates Regulation	Indicates Department	Indicates Course Number
A :B. Tech. B : M. Tech. C : MBA	1 : R11 2 : R14 3 : R15 4 : R18	1 : WMC 2 : CSE 3 : PEED 4 : DECS 5 : SE 6 : ES 7 : ED 8 : Structural Engg. 9 : Other	01 02

- ❖ T – Tutorial, P – Practical, D – Drawing, L - Theory, C - Credits

FOREWORD

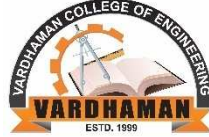
The autonomy conferred on Vardhaman College of Engineering by UGC based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the norms set by the monitoring bodies like UGC and AICTE. It reflects the confidence of the UGC in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards Degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

Vardhaman College of Engineering is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Board of Studies are constituted under the guidance of the Governing Body of the College and recommendations of the JNTUH to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after a prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the college in order to produce quality engineering graduates for the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications, if needed, are to be sought, at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

PRINCIPAL



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Institute Vision:

- ❖ To be a pioneer institute and leader in engineering education to address societal needs through education and practice.

Institute Mission:

- ❖ To adopt innovative student centric learning methods.
- ❖ To enhance professional and entrepreneurial skills through industry institute interaction.
- ❖ To train the students to meet dynamic needs of the society.
- ❖ To promote research and continuing education.

Quality Policy:

- ❖ We at Vardhaman College of Engineering, endeavour to uphold excellence in all spheres by adopting best practices in effort and effect.

Department Vision:

- ❖ Producing professionally competent graduates in the domain of Electrical Engineering to serve the industry/society addressing the challenges.

Department Mission:

- ❖ Provide professional skills in electrical circuit design and simulation to the students
- ❖ Develop industry institute interface for collaborative research, internship and entrepreneurial skills among the stakeholders(Faculty and Students)
- ❖ Bringing awareness among the students with emerging technologies to meet the dynamic needs of the society
- ❖ Encourage multi-disciplinary activities through research and continuous learning activities.



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ACADEMIC REGULATIONS

**M.Tech. Regular Two Year Post-Graduate Programme
(For the batches admitted from the Academic Year 2018–2019)**

For pursuing two year PG program of study in Master of Technology (M.Tech.) offered by Vardhaman College of Engineering and herein after Vardhaman College of Engineering is referred to as VCE.

1. APPLICABILITY

All the rules specified herein, approved by the Academic Council, will be in force and applicable to students admitted from the academic year 2018-2019 onwards. Any reference to “College” in these rules and regulations stands for Vardhaman College of Engineering.

2. EXTENT

All the rules and regulations, specified herein after shall be read as a whole for the purpose of interpretation and as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies Principal, Vardhaman College of Engineering shall be the Chairman, Academic Council.

3. PROGRAMS OFFERED

Vardhaman College of Engineering, an autonomous college affiliated to JNTUH, offers the following M. Tech. programmes of study leading to the award of M. Tech. degree under the autonomous scheme.

S. No	M.Tech Courses	Offering Department	Intake
1	Computer Science and Engineering	CSE	18
2	Digital Electronics and Communication Systems	ECE	18
3	Embedded Systems	ECE	18
4	Power Electronics and Electrical Drives	EEE	18
5	Engineering Design	ME	18
6	Structural Engineering	CE	18

4. ADMISSION

Admission into first year of two Year M.Tech degree program of study:

4.1.1. Eligibility

Admission to the M.Tech degree program shall be made subject to the eligibility, qualifications and specialization prescribed by Telangana State Council of Higher Education TSCHE, Government of Telangana.

Admissions shall be made based on the rank secured in PGCET examination conducted by Telangana State Council for Higher Education (or) GATE examination for allotment of a seat by the Convener, PGCET subject to reservations prescribed by the University or policies formed by the Government of Telangana from time to time.

4.2. Admission Procedure:

Admissions are made into the first year of two year M.Tech program as per the stipulations of Telangana State Council of Higher Education (TSCHE), Government of Telangana.

(a) Category - A seats are filled by the Convener, PGCET.

(b) Category - B seats are filled by the Management.

5. MEDIUM OF INSTRUCTION

The medium of instruction and examination is English for all the courses.

6. DURATION OF THE PROGRAMS

6.1 Normal Duration

M. Tech degree program extends over a period of two academic years leading to the Degree of Master of Technology (M.Tech) of the Jawaharlal Nehru Technology University Hyderabad.

6.2 Maximum Duration

6.2.1 The maximum period within which a student must complete a full-time academic program (Course Work i.e clearing all theory subjects) is 4 years for M.Tech. If a student fails to complete the academic program within the maximum duration as specified above, he / she will be required to withdraw from the program.

6.2.2 The period is reckoned from the academic year in which the student is admitted first time into the degree programme.

7. SEMESTER STRUCTURE

The College shall follow semester pattern. An academic year shall consist of a first semester and a second semester and the summer term. Each semester shall be of 21 weeks duration and this period includes time for course work, examination preparation, and conduct of examinations. Each semester shall have a minimum of 90 working days including Examinations. The academic calendar is shown in Table 2 is declared at the start of the semester. The duration for each semester shall be a minimum of 16 weeks of instruction.

Table 2: Academic Calendar

I Year I Semester (21 weeks)	Instruction Period	:16 weeks	18 weeks
	Mid Semester Tests	:2 weeks	
	Preparation & Practical Examinations		1 week
	External Examinations		2 weeks
Semester Break			2 weeks
I Year II Semester (21 weeks)	Instruction Period	:16 weeks	18 weeks
	Mid Semester Tests	:2 weeks	
	Preparation & Practical Examinations		1 week
	External Examinations		2 weeks
Summer Vacation			4 weeks
II Year I Semester (20 Weeks)	Instruction Period and Project Phase- I		18 weeks
	Mid semester tests		
	Preparation and External Examinations		2 weeks
	Semester Break		2 weeks
II Year II Semester (18 weeks)	Project Work Phase – II		18 weeks

8. CHOICE BASED CREDIT SYSTEM

All the academic programs under autonomy are based on credit system. Credits are assigned based on the following norms:

8.1 The duration of each semester will normally be 21 weeks with 6 days a week. A working day shall have 6 periods each of 60 minutes duration.

- 1 credit per lecture period per week
- 2 credits for four period hours of practical
- 2 credits for mini project with seminar
- 10 credits for project work phase – I
- 16 credits for project work phase – II

8.2 The two year curriculum of any M.Tech Specialization of study shall have total of 68 credits. The exact requirements of credits for each course will be as recommended by the Board of Studies concerned and approved by the Academic Council.

9. COURSE REGISTRATION

- 9.1. A 'faculty advisor or counsellor' shall be assigned to a group of 5 students, who will advise student about the Post graduate program, its course structure and curriculum, choice/option for subjects/courses, based on their competence, progress, pre-requisites and interest.
- 9.2. The college Exam cell invites 'registration forms' from students before the beginning of the semester through 'on-line registration', ensuring 'date and time stamping'. The on-line registration requests for any 'current semester' shall be completed before the commencement of SEEs (Semester End Examinations) of the 'preceding semester'.
- 9.3. A student can apply for on-line registration, only after obtaining the 'written approval' from faculty advisor/counsellor, which should be submitted to the Examination section through the Head of the Department. A copy of it shall be retained with Head of the Department, faculty advisor/counsellor and the student.
- 9.4. If the student submits ambiguous choices or multiple options or erroneous entries during on-line registration for the subject(s)/course(s) under a given/specified course group/category as listed in the course structure, only the first mentioned subject/ course in that category will be taken into consideration.
- 9.5. Subject/course options exercised through on-line registration are final and cannot be changed or inter-changed; further, alternate choices also will not be considered. However, if the subject/course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the head of the department, with due notification and time-framed schedule, within the first week after the commencement of class-work for that semester.
- 9.6. Open electives: The students have to choose one open elective (OEC) during II year I semester from the list of open electives given. However, the student cannot opt for an open elective subject offered by their own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.
- 9.7. Program Electives: The students have to choose Program elective I & II (PEC) in I year I semester, Program electives III, IV in I year II semester and Program elective V in II year I from the list of program electives given.

10. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in each semester shall be evaluated subject- wise (irrespective of credits assigned) for a maximum of 100 marks. The M.Tech.project work (major project) will be evaluated for 200 marks. (100 marks for Phase – I and 100 marks for Phase – II)

- 10.1. For the theory subjects 70 marks shall be awarded for the performance in the Semester End Examination (SEE) and 30 marks shall be awarded for Continuous Internal Evaluation (CIE). The Final marks of Continuous Internal Evaluation is calculated based on 75% of best Marks and 25% of least marks secured in the two Mid-Term Examinations conducted. First Mid-Term examinations will be conducted in the middle of the Semester and second Mid-Term

examinations during the last week of instruction. Each Mid-Term Examination shall be conducted for a total duration of 90 minutes. The question paper consist of 5 questions out of which 3 questions are to be answered, each question carrying 10 marks for a total of 30 marks. The details of the Question Paper pattern for Semester End Examination (Theory) are given below:

The Semester End Examination will be conducted for 70 marks. It consists of two parts.

- i. Part A for 20 marks,
- ii. Part B for 50 marks.

Part A is compulsory and consists of 5 questions, one from each unit and carrying 4 marks each. Part B consists of 5 questions carrying 10 marks each. There will be two questions from each unit and only one should be answered.

The question paper shall be set externally and valued both internally and externally. If the difference between both the valuations is less than 15 marks, the average marks of the two valuations shall be awarded as final marks, otherwise third valuation will be conducted and the average marks of the best two valuations shall be awarded as final marks.

- 10.2.** For practical subjects, 70 marks shall be awarded for performance in the Semester End Examinations and 30 marks shall be awarded for day-to-day performance as Internal Marks.
- 10.3.** For conducting laboratory end examinations of all PG Programs, one internal examiner and one external examiner are to be appointed by the Principal of the College and this is to be informed to the Controller of Examinations within two weeks, before commencement of the lab end examinations. The external examiner should be selected from outside the College.
- 10.4.** Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.
- 10.5.** A Project Review Committee (PRC) shall be constituted with the Head of the Department as Chairperson, Project Supervisor and one senior faculty member of the Departments offering the M. Tech programme.
- 10.6.** A candidate has to present in Project Work Review I, in consultation with his Project Supervisor, the title, objective and plan of action of his project work to the Project Work Review Committee (PRC) for approval within four weeks from the commencement of Second year First Semester. Only after obtaining the approval of the PRC the student can initiate the Project work.
- 10.7.** If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the PRC. However, the PRC shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.
- 10.8.** A candidate shall submit his project progress report in two stages one in II year I semester and final one at the end of II year II Semester.
- 10.9.** The work on the project shall be initiated at the beginning of the II year I Semester and the duration of the project is two semesters. A candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC not earlier than 40 weeks from the date of approval of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.
- 10.10.** The Project Work Review II in II Year I Sem. carries internal marks of 100. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate the work for the other 50 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Project Work. A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review

II (Phase –I) . If he fails to obtain the minimum required marks, he has to reappear for Project Work Review-II as and when conducted.

- 10.11.** The Project Work Review III in II Year II Sem.(Phase –II) carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor will evaluate it for the other 50 marks. The PRC will examine the overall progress of the Project Work and decide whether or not the Project is eligible for final submission. A candidate has to secure a minimum of 50% of marks to be declared successful in Project Work Review III. If he fails to obtain the required minimum marks, he has to reappear for Project Work Review III as and when conducted. For Project Evaluation (Viva Voce) in II Year II Sem. there are external marks of 100 and it is evaluated by the external examiner. The candidate has to secure a minimum of 50% marks in Project Evaluation (Viva-Voce) examination.
- 10.12.** After approval from the PRC, a soft copy of the thesis should be submitted for ANTIPLAGIARISM check and the plagiarism report should be submitted to the COE and to be included in the final thesis. The Thesis will be accepted for submission, if the similarity index is less than 30%. If the similarity index has more than the required percentage, the student is advised to modify accordingly and re-submit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to THREE. After three attempts, the admission is liable to be cancelled. The departments HODs are advised to make plagiarism check of every soft copy of theses before submissions.
- 10.13.** Three copies of the Project Thesis certified by the supervisor shall be submitted to the department, after submission of a research paper related to the project work in any peer reviewed Journal or Scopus Indexed Conference. A copy of the submitted research paper shall be attached to thesis.
- 10.14.** The thesis shall be adjudicated by an external examiner selected by the Principal. For this, the department HOD shall submit a panel of three examiners from among the list of experts in the relevant specialization as submitted by the supervisor concerned.
- 10.15.** If the report of the external examiner is unsatisfactory, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unsatisfactory again, the thesis shall be summarily rejected. Subsequent actions for such dissertations may be considered, only on the specific recommendations of the external examiner and /or Project work Review Committee. No further correspondence in this matter will be entertained, if there is no specific recommendation for resubmission.
- 10.16.** If the report of the examiner is satisfactory, the Head of the Department shall coordinate and make arrangements for the conduct of Project Viva- Voce examination. The Project Viva-Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the external examiner who adjudicated the Thesis. The candidate has to secure a minimum of 50% of marks in Project Evaluation (Viva-Voce) examination.
- 10.17.** If he fails to fulfill the requirements as specified above, he will reappear for the Viva-Voce examination only after three months. In the reappeared examination also, if he fails to fulfill the requirements, he will not be eligible for the award of the degree, unless he is asked to revise and resubmit his project work by the board within a specified time period .The Project Viva-Voce External examination marks must be submitted to the Exam cell on the day of the examination.
- 10.18.** A candidate shall be given one chance for a maximum of Three Theory subjects for Improvement of Internal evaluation marks for which the candidate has to re-register for the chosen subjects and fulfill the academic requirements.
- 10.19.** For each subject, the candidate has to pay a fee equivalent to one third of the semester tuition fee and the amount is to be remitted in the form of D.D. in favour of the Principal, Vardhaman College of Engineering payable at Hyderabad along with the requisition through the concerned Head of the Department.

10.20. Audit course examination will be conducted at the end of the semester through open book system and evaluated internally.

11. ATTENDANCE REQUIREMENTS TO APPEAR FOR THE SEMESTER-END EXAMINATION

- 11.1. A student shall be eligible to appear for semester-end examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- 11.2. Condonation of shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester may be granted by the College Academic Council.
- 11.3. Shortage of attendance below 65% in aggregate shall in no case be condoned.
- 11.4. Students whose shortage of attendance is not condoned in any semester are not eligible to take their semester-end examination of that class and their registration shall stand cancelled.
- 11.5. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the current semester. The student may seek readmission for the semester when offered next. He will not be allowed to register for the subjects of the semester while he is in detention. A student detained due to shortage of attendance, will have to repeat that semester when offered next.
- 11.6. A stipulated fee shall be payable towards condonation of shortage of attendance to the College.
- 11.7. Attendance may also be condoned as per the recommendations of academic council for those who participate in prestigious sports, co-curricular and extra-curricular activities provided as per the Govt. of Telangana norms in vogue.

12. ACADEMIC REQUIREMENTS FOR PROMOTION / COMPLETION OF REGULAR M.TECH PROGRAMME OF STUDY

The following academic requirements have to be satisfied in addition to the attendance requirements for promotion / completion of regular M.Tech programme of study.

- i. A student shall be deemed to have satisfied the minimum academic requirements for each theory, and practical, if he secures not less than **40%** of marks in the semester-end examination and a minimum of **50%** of marks in the sum of the internal evaluation and semester - end examination taken together.
- ii. In case of Mini Project with seminar, a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each of them if he secures not less than **50%** of marks.
- iii. In case of project work, a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted if he secures not less than **50%** of marks on the aggregate in the internal evaluation and external end-evaluation taken together.
- iv. A student shall register for all the **68** credits and earn all the **68** credits. Grades obtained in all the 68 credits shall be considered for the award of the class based on aggregate of grades (CGPA).
- v. Students who are detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the course in earlier regulations (or) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same (or) equivalent subjects as and when subjects are offered, and pursue the remaining course work with the academic regulations of the batch into which such students are readmitted. However, all such readmitted students shall earn all the credits of subjects they have pursued for completion of the course.

13. SUPPLEMENTARY EXAMINATION

Supplementary examinations for the odd semester shall be conducted with the regular examinations of even semester and vice versa, for those who appeared and failed in regular examinations. Such of the candidates writing supplementary examinations may have to write more than one examination per day, if it is scheduled.

14. REVALUATION

Students shall be permitted to apply for revaluation(Only for theory courses) after the declaration of semester end examination results within due dates by paying prescribed fee. After revaluation if there is any betterment in the grade then improved grade will be considered. Otherwise old grade shall be retained.

15. TRANSITORY REGULATIONS

Students who are detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the course in earlier regulations (or) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same (or) equivalent subjects as and when subjects are offered, and pursue the remaining course work with the academic regulations of the batch into which such students are readmitted. A regular student has to satisfy all the eligibility requirements within the maximum stipulated period of four years for the award of M. Tech. Degree.

16. TRANSCRIPTS

After successful completion of the entire programme of study, a transcript containing performance of all academic years will be issued as a final record. Transcripts will also be issued, if required, after payment of requisite fee. Partial transcript will also be issued upto any point of study to a student on request, after payment of requisite fee.

17. AWARD OF DEGREE

The degree will be conferred and awarded by Jawaharlal Nehru Technological University Hyderabad on the recommendations of the Chairman, Academic Council.

17.1. Eligibility

A student shall be eligible for the award of M. Tech. Degree, if he fulfils all the following conditions:

- i. Registered and successfully completed all the components prescribed in the programme of study to which he is admitted.
- ii. Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of study within the stipulated time.
- iii. Obtained not less than 50% of marks (minimum requirement for declaring as passed).
- iv. Has no dues to the college, hostel, and library etc. and to any other amenities provided by the College.
- v. No disciplinary action is pending against him.

17.2. Award of Class

After a student has satisfied the requirement prescribed for the completion of the Program and is eligible for the award of M. Tech. Degree, he shall be placed in one of the following four classes shown in Table 3:

Table 3: Declaration of Class based on CGPA (Cumulative Grade Point Average)

Class Awarded	Grades to be Secured	From the aggregate marks secured from 68 Credits
First Class with Distinction	≥ 7.75 CGPA	
First Class	$=6.75$ to <7.75 CGPA	
Pass Class	$=6.0$ to <6.75 CGPA	
Fail	Below 6.0 CGPA	

17.3. Letter Grade and Grade Point

It is necessary to provide equivalence of percentages and/or Class awarded with GradePoint Average (GPA). This shall be done by prescribing certain specific thresholds in averages for Distinction, First Class and Pass Class, as mentioned in Table 4.

Table 4: Percentage Equivalence of Grade Points (For a 10-Point Scale)

Grade	Grade Points (GP)	Percentage of Marks
O	10	≥ 90
A+	9	≥ 80 and <90

A	8	≥70 and < 80
B+	7	≥ 60 and <70
B	6	≥ 50 and <60
F	0	Below 50
AB	0	ABSENT

To calculate the final percentage of marks equivalent to the computed CGPA, the following formula may be used.

$$\text{Percentage of marks} = (\text{CGPA} - 0.5) \times 10$$

Semester Grade Point Average (SGPA)

The 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.

$$\text{SGPA} (S_i) = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

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

Cumulative Grade Point Average (CGPA)

The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$\text{CGPA} = \frac{\sum (C_i \times S_i)}{\sum C_j}$$

Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

C_j is the total number of credits of entire program.

18. REGISTRATION

Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar. It is absolutely compulsory for the student to register for courses in time.

19. TERMINATION FROM THE PROGRAM

The admission of a student to the program may be terminated and the student is asked to leave the college in the following circumstances:

- i. The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.
- ii. The student fails to satisfy the norms of discipline specified by the institute from time to time.

20. CURRICULUM

21.1. For each program being offered by the Institute, a Board of Studies (BOS) is constituted in accordance with AICTE / UGC / JNTUH statutes.

21.2. The BOS for a program is completely responsible for designing the curriculum once in three years for that program.

21. WITH-HOLDING OF RESULTS

If the candidate has not paid any dues to the college / if any case of indiscipline / malpractice is pending against him, the results of the candidate will be withheld. The issue of the degree is liable to be withheld in such cases.

22. GRIEVANCES REDRESSAL COMMITTEE

"Grievance and Redressal Committee" (General) constituted by the principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters. The composition of the complaints cum redressal committee shall be:

Headed by Senior Faculty member

Heads of all departments

A senior lady staff member from each department (if available)

The committee constituted shall submit a report to the principal of the college, the penalty to be imposed. The Principal upon receipt of the report from the committee shall, after giving an opportunity of being heard to the person complained against, submit the case with the committee's recommendation to the Governing Body of the college. The Governing Body shall confirm with or without modification the penalty recommended after duly following the prescribed procedure.

23. MALPRACTICE PREVENTION COMMITTEE

A malpractice prevention committee shall be constituted to examine and punish the students who does malpractice / behaves indisciplinately in examinations. The committee shall consist of:

Principal

Subject expert of which the subject belongs to

Head of the department of which the student belongs to

The invigilator concerned

In-charge Examination branch of the college

The committee constituted shall conduct the meeting on the same day of examination or latest by next working day to the incidence and punish the student as per the guidelines prescribed by the JNTUH from time to time.

Any action on the part of candidate at the examination like trying to get undue advantage in the performance at examinations or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff, who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

24. AMENDMENTS TO REGULATIONS

The Academic Council of Vardhaman College of Engineering reserves the right to revise, amend, or change the regulations, scheme of examinations, and / or syllabi or any other policy relevant to the needs of the society or industrial requirements etc., without prior notice.

25. STUDENTS' FEEDBACK

It is necessary for the Colleges to obtain feedback from students on their course work and various academic activities conducted. For this purpose, suitable feedback forms shall be devised by the College and the feedback obtained from the students regularly in confidence, by administering the feedback form in print or on-line in electronic form.

The feedback received from the students shall be discussed at various levels of decision making at the College and the changes/ improvements, if any, suggested shall be given due consideration for implementation.

26. GRADUATION DAY

The College shall have its own annual *Graduation Day* for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute.

The College shall institute Prizes and Awards to meritorious students, for being given away annually at the *Graduation Day*. This will greatly encourage the students to strive for excellence in their academic work.

27. AWARD OF A RANK UNDER AUTONOMOUS SCHEME

27.1. One (1) Merit Rank will be declared only for those students who have been directly admitted in VCE under Autonomous Regulations and complete the entire course in VCE only within the minimum possible prescribed time limit, i.e., 2 years for M. Tech.

27.2. A student shall be eligible for a merit rank at the time of award of degree in each branch of Master of Technology, provided the student has passed all subjects prescribed for the particular degree program in first attempt only.

27.3. Award of prizes, scholarships, or any other Honours shall be based on the rank secured by a candidate, consistent with the guidelines of the Donor, wherever applicable.

28. CONDUCT AND DISCIPLINE

28.1. Each student shall conduct himself / herself in a manner befitting his / her association with VCE.

28.2. He / she is expected not to indulge in any activity, which is likely to bring disrepute to the college.

28.3. He / she should show due respect and courtesy to the teachers, administrators, officers and employees of the college and maintain cordial relationships with fellow students.

28.4. Lack of courtesy and decorum unbecoming of a student (both inside and outside the college), wilful damage or removal of Institute's property or belongings of fellow students, disturbing others in their studies, adoption of unfair means during examinations, breach of rules and regulations of the Institute, noisy and unruly behaviour and similar other undesirable activities shall constitute violation of code of conduct for the student.

28.5. **Ragging in any form is strictly prohibited and is considered a serious offence. It will lead to the expulsion of the offender from the college.**

28.6. Violation of code of conduct shall invite disciplinary action which may include punishment such as reprimand, disciplinary probation, debarring from the examination, withdrawal of placement services, withholding of grades / degrees, cancellation of registration, etc., and even expulsion from the college.

28.7. Principal, based on the reports of the warden of Institute hostel, can reprimand, impose fine or take any other suitable measures against an inmate who violates either the code of conduct or rules and regulations pertaining to college hostel.

28.8. A student may be denied the award of degree / certificate even though he / she have satisfactorily completed all the academic requirements if the student is found guilty of offences warranting such an action.

28.9. Attendance is not given to the student during the suspension period.

29. OTHER ISSUES

The quality and standard of engineering professionals are closely linked with the level of the technical education system. As it is now recognized that these features are essential to develop the intellectual skills and knowledge of these professionals for being able to contribute to the society through productive and satisfying careers as *innovators, decision makers and/or leaders* in the global economy of the 21st century, it becomes necessary that certain improvements are introduced at different stages of their education system. These include:

- i. Selective admission of students to a programme, so that merit and aptitude for the chosen technical branch or specialization are given due consideration.
- ii. Faculty recruitment and orientation, so that qualified teachers trained in good teaching methods, technical leadership and students' motivation are available.
- iii. Instructional/Laboratory facilities and related physical infrastructure, so that they are adequate and are at the contemporary level.
- iv. Access to good library resources and Information & Communication Technology (**ICT**) facilities, to develop the student's *mind* effectively.

These requirements make it necessary for the College to introduce improvements like:

- i. Teaching-learning process on modern lines, to provide *Add-On* Courses for *audit/credit* in a number of peripheral areas useful for students' self-development.
- ii. Life-long learning opportunities for faculty, students and alumni, to facilitate their dynamic interaction with the society, industries and the world of work.
- iii. Generous use of ICT and other modern technologies in everyday activities.

30. GENERAL

Where the words "he", "him", "his", "himself" occur in the regulations, they include "she", "her", "herself".

Note: Failure to read and understand the regulations is not an excuse.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the student:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the student is to be cancelled and sent to the University.
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out,	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the

	or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9.	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

COURSE STRUCTURE (VCE-R18)

M.TECH – POWER ELECTRONICS AND ELECTRICAL DRIVES

REGULATIONS: VCE-R18

I YEAR I SEMESTER							
Code	Subject	Periods per Week		Credits	Scheme of Examination		
		L	P		Maximum Marks		
					Internal	External	Total
B4301	Modeling and Analysis of Electrical Machines	3	0	3	30	70	100
B4302	Electrical Drives System	3	0	3	30	70	100
B4905	Research Methodology and IPR	2	0	2	30	70	100
	PROGRAM ELECTIVE - I	3	0	3	30	70	100
	PROGRAM ELECTIVE - II	3	0	3	30	70	100
B4303	Electrical Drives Laboratory	0	4	2	30	70	100
B4304	Electrical Machines Laboratory	0	4	2	30	70	100
	Audit Course -I	2	0	0	100*	-	100*
	TOTAL	16	08	18	210	490	700
I YEAR II SEMESTER							
Code	Subject	Periods per Week		Credits	Scheme of Examination		
		L	P		Maximum Marks		
					Internal	External	Total
B4305	Power Electronic Converters	3	0	3	30	70	100
B4306	Digital Control of Power Electronic and Drive Systems	3	0	3	30	70	100
	PROGRAM ELECTIVE - III	3	0	3	30	70	100
	PROGRAM ELECTIVE - IV	3	0	3	30	70	100
B4307	Mini Project with Seminar	0	4	2	100	-	100
B4308	Power Electronics Laboratory	0	4	2	30	70	100
B4309	Micro-controller Lab	0	4	2	30	70	100
	Audit Course- II	2	0	0	100*	-	100*
	TOTAL	14	12	18	280	420	700
II YEAR I SEMESTER							
Code	Subject	Periods per Week		Credits	Scheme of Examination		
		L	P		Maximum Marks		
					Internal	External	Total
	PROGRAM ELECTIVE - V	3	0	3	30	70	100
	OPEN ELECTIVE	3	0	3	30	70	100
B4310	Major Project Phase-I	0	20	10	100	0	100
	TOTAL	6	20	16	160	140	300
II YEAR II SEMESTER							
Code	Subject	Periods per Week		Credits	Scheme of Examination		
		L	P		Maximum Marks		
					Internal	External	Total
B4311	Major ProjectPhase-II	0	32	16	30	70	100
	TOTAL	0	32	16	30	70	100

MTECH – POWER ELECTRONICS AND ELECTRICAL DRIVES

REGULATIONS: VCE-R18

PROGRAM ELECTIVES			
PROGRAM ELECTIVE - I		PROGRAM ELECTIVE – II	
Code	Subject	Code	Subject
B4351	Advanced Power ElectronicCircuits	B4354	Static VAR Controllers and Harmonic Filtering
B4352	Optimal and Adaptive Control	B4355	PWM converter andApplications
B4353	Power Quality	B4356	Power SemiconductorDevices & Modeling
PROGRAM ELECTIVE – III		PROGRAM ELECTIVE – IV	
Code	Subject	Code	Subject
B4357	Switched Mode and Resonant Converters	B4360	Advanced Microcontroller based Systems
B4358	Industrial Load Modeling and Control	B4361	Distributed Generation
B4359	Advanced Digital Signal Processing	B4362	SmartGrids
PROGRAM ELECTIVE - V			
B4363	SCADA Systems andApplications		
B4364	FACTS and Custom PowerDevices		
B4365	High Voltage DC Transmission		
OPEN ELECTIVES		AUDIT COURSE-I & II	
B4901	Business Analytics	B4911	English for Research Papers Writing
B4902	Industrial safety	B4912	Disaster Management
B4903	Operations Research	B4913	Sanskrit for Technical Knowledge
B4904	Waste to Energy	B4914	Value Education
		B4915	Constitution of India
		B4916	Pedagogy Studies
		B4917	Stress Management by Yoga
		B4918	Personality Development through Life Enlightenment skills.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I YEAR I SEMESTER

Modeling and Analysis of Electrical Machines

Course Code: B4301

L	P	C
3	0	3

UNIT - I

Principles of Electromagnetic Energy Conversion. General expression of stored magnetic energy. Co-energy and force/torque, example using single and doubly excited system.

UNIT - II

Basic Concepts of Rotating Machines- Calculation of air gap mmf and per phase, machine inductance using physical machine data; Voltage and torque equation of dc machine.

UNIT - III

Three phase symmetrical induction machine and salient pole synchronous, machines in phase variable form, Application of reference frame theory to three phase symmetrical induction and synchronous machines, Dynamic direct and quadrature axis model in arbitrarily rotating reference frames.

UNIT - IV

Determination of Synchronous machine dynamic equivalent circuit parameters, Analysis and dynamic modeling of two phase asymmetrical induction machine and single phase induction machine.

UNIT - V

Special Machines - Permanent magnet synchronous machine, Surface permanent magnet (square and sinusoidal back emf type) and interior, permanent magnet machines, Construction and operating principle Dynamic modelling and self-controlled operation.

Analysis of Switch Reluctance Motors. Brushless D.C. Motor for space Applications, Recent trends.

TEXT BOOKS:

1. Charles Kingsle, Jr., A.E. Fitzgerald, Stephen D. Umans, "Electric Machinery", Tata Mcgraw Hill.
2. R. Krishnan, "Electric Motor & Drives: Modeling, Analysis and Control", Prentice Hall of India.

REFERENCE BOOKS:

1. Miller, T.J.E., "Brushless Permanent Magnet and Reluctance Motor Drives", Clarendon Press.
2. P.C. Krause "Analysis of Electric Machine" Wiley IEEE Press 3rd Edition.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I YEAR I SEMESTER

ELECTRICAL DRIVES SYSTEM

Course Code: B4302

L P C
3 0 3

UNIT - I

Dynamics of Electric Drives: Fundamentals of torque equation. Speed torque convention and multi-quadrant operation, components of load torques.

UNIT - II

Classification of load torques steady state stability. Load equation, Speed control and drive classification. Close loop control of drives.

UNIT - III

DC motor Drives-Modeling of DC machines. Steady state characteristics with armature and speed control. Phase controlled DC motor drives, chopper controlled DC motor drives.

UNIT - IV

Poly-phase induction machines- Dynamic modeling of induction machines. Small signal equations, control characteristics of induction machines. Phase-controlled induction machines. Stator voltage control. Slip energy recovery scheme, frequency control and vector control of induction motor drives.

UNIT - V

Traction motor: Starting Speed-Time characteristics, Braking, Traction motors used in practice. Industrial Drives-Digital Control of Electric Drives, Stepper motor, Servo motor and their Applications

TEXT BOOKS:

1. G.K. Dubey, "Power semiconductor controlled Drives", Prentice Hall international, New Jersey, 1989.
2. R. Krishnam, "Electric motor drives modeling, analysis and control", PHI-India-2009.
3. G. K. Dubey, "Fundamentals of electric Drives, Narosa Publishing House", 2nd edition, 2011.

REFERENCE BOOKS:

1. W. Leonhard, "Control of Electrical drives", Springer, 3rd edition, 2001.
2. P.C. Krause -, "Analysis of Electric Machine", Wiley-IEEE press 3rd edition
3. K. Bose, "Modern Power Electronics and AC Drives", Prentice Hall publication, 1st edition, 2001.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR I SEMESTER

RESEARCH METHODOLOGY AND IPR

Course Code: B4905

L	P	C
2	0	2

Unit 1: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Unit 2: Effective literature studies approaches, analysis Plagiarism, Research ethics

Unit 3: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Unit 4: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grant of patents, Patenting under PCT.

Unit 5: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1. *Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students.*
2. *Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction.*

REFERENCE BOOKS:

1. *T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.*
2. *Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners.*

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I YEAR I SEMESTER

ELECTRICAL DRIVES LABORATORY

Course Code: B4303

L	P	C
0	4	2

LIST OF EXPERIMENTS:

1. Speed measurement and closed loop control using PMDC motor.
2. Thyristorised drive for PMDC motor with speed measurement and closed loop control.
3. IGBT used single 4 quadrant chopper drive for PMDC motor with speed measurement and closed loop control.
4. Thyristorised drive for 1Hp DC motor with closed loop control.
5. 3- Phase input, Thyristorised drive, 3 Hp DC motor with closed loop.
6. 3- Phase input IGBT, 4 quadrant chopper drive for DC motor with closed loop control equipment.
7. Cycloconverter based AC Induction motor control equipment.
8. Speed control of 3 phase wound rotor Induction motor.
9. Single phase full controlled converter with inductive load.
10. Single phase Half controlled converter with inductive load.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I YEAR I SEMESTER

ELECTRICAL MACHINES LABORATORY

Course Code: **B4304**

L P C
0 4 2

LIST OF EXPERIMENTS:

1. Load test on dc shunt motor to draw speed – torque and horse power – efficiency characteristics.
2. Field Test on dc series machines.
3. Speed control of dc shunt motor by armature and field control.
4. Swinburne's Test on dc motor.
5. Retardation test on dc shunt motor.
6. Regenerative test on dc shunt machines.
7. Load test on three phase induction motor.
8. No load and Blocked rotor test on three phase induction motor
9. Synchronization of Alternator
10. Load test on single phase induction motor to draw output versus torque, current, power and efficiency characteristics.
11. Conduct suitable tests to draw the equivalent circuit of single phase induction motor and determine performance parameters.
12. Conduct an experiment to draw V and curves of synchronous motor at no load and load conditions.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR II SEMESTER

POWER ELECTRONIC CONVERTERS

Course Code: B4305

L	P	C
3	0	3

UNIT - I

Analysis of power semiconductor switched circuits with R, L, RL, RC loads D.C. motor load. Battery charging circuit.

UNIT - II

Single-Phase and Three-Phase AC to DC converters. Half controlled configurations-operating domains of three phase full converters and semi-converters. Reactive power considerations.

UNIT - III

Analysis and design of DC to DC converters. Control of DC-DC converters: Buck converters, Boost converters, BuckBoost converters, Cuk converters.

UNIT - IV

Single phase and three phase inverters. Voltage source and Current source inverters. Voltage control and harmonic minimization in inverters.

UNIT - V

AC to AC power conversion using voltage regulators. Choppers and cyclo-converters. Consideration of harmonics, introduction to Matrix converters. Design aspects of converters, Few practical applications.

TEXT BOOKS:

1. Ned Mohan, Undeland and Robbin, "Power Electronics: converters, Application and design", John's Wiley and sons. Inc, Newyork.

REFERENCE BOOKS:

1. M.H.Rashid, "Power Electronics", Prentice Hall of India 1994.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR II SEMESTER

DIGITAL CONTROL OF POWER ELECTRONIC AND DRIVES SYSTEMS

Course Code: B4306

L	P	C
3	0	3

UNIT-I:

Review of numerical methods, Application of numerical methods to solve transients in D.C, Switched R, L, R-L, R-C and R-L-C circuits. Extension to AC circuits.

UNIT-II:

Modelling of diode in simulation, Diode with R, R-L, R-C and R-L-C load with AC supply, Modelling of SCR, TRIAC, IGBT and Power Transistors in simulation, Application of numerical methods to R, L, C circuits with power electronic switches. Simulation of gate/base drive circuits, simulation of snubber circuits.

UNIT-III:

State space modelling and simulation of linear systems. Introduction to electrical machine modelling: induction, DC, and synchronous machines, simulation of basic electric drives, stability aspects

UNIT-IV:

Simulation of single phase and three phase uncontrolled and controlled (SCR) rectifiers. Converters with self-commutated devices- simulation of power factor correction schemes.

Simulation of converter fed DC motor drives. Simulation of thyristor choppers with voltage. Current and load commutation schemes. Simulation of chopper fed DC motor

UNIT-V:

Simulation of single and three phase inverters with thyristors and self commutated devices. Space vector representation. Pulse-width modulation methods for voltage control. Waveform control. Simulation of inverter fed induction motor drives

TEXT BOOKS:

1. *Simulink Reference Manual, Math works, USA.*

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR II SEMESTER

POWER ELECTRONICS LABORATORY

Course Code: B4308

L	P	C
0	4	2

LIST OF EXPERIMENTS:

1. MATLAB Simulation of Single phase full converter using RL&E loads.
2. MATLAB Simulation of Single phase Semi converter using RL&E loads.
3. MATLAB Simulation of Three phase full converter using RL&E loads.
4. MATLAB Simulation of Three phase Semi converter using RL&E loads.
5. MATLAB Simulink model of Induction Motor Drive.
6. MATLAB Simulink model of D.C Motor Drive.
7. MATLAB Simulation of Single phase AC Voltage controller using RL load.
8. MATLAB Simulation of Single phase inverter with R,RL loads.
9. MATLAB Simulation of Three phase inverter with PWM controller.
10. MATLAB Simulation of Chopper using RLE load.
11. MATLAB Simulation of Cycloconverter based AC Induction motor.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR II SEMESTER

MICRO - CONTROLLER LAB

Course Code:**B4309**

L P C
0 4 2

EXPERIMENTS ON ASSEMBLY PROGRAMMING

1. Write a program to multiplication and division using MUL and DIV instructions.
2. Write a program to transfer a block of data from internal memory to external memory.
3. Write a program to exchange two set of eight-byte data.
4. Write a program to find the sum of two numbers in decimal.
5. Write a program to convert decimal number to hexadecimal.
6. Write a program to add a number n, m number of times.
7. Write program to find the largest from a set of n numbers.
8. Write program for sorting the given set of numbers.

EXPERIMENTS ON 8051 INTERFACING

1. Write an assembly language program for generating a triangular wave.
2. Write a program to find the largest from a set of ten numbers and display it using LEDs.
3. Write a program to for displaying the decimal numbers in 7 Segment display.
4. Write a program to read the DIP Switches for displaying the reading using 7 Segment display.
5. Write a program to rotate the given motor in clockwise direction.
6. Write a program to rotate the given motor in anticlockwise direction.
7. Write a program to generate a square wave.
8. Write a program to display a message in LCD display

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEEDI YEAR I SEMESTER

ADVANCED POWER ELECTRONIC CIRCUITS

(Program Elective-I)

Course Code: B4351

L	P	C
3	0	3

UNIT-I

Boost type APFC and control.

UNIT-II

Three phase utility interphases and control-Buck, Boost, Buck-Boost SMPS, Topologies.

UNIT-III

Modes of operation –Push-Pull and Forward Converter Topologies - Voltage Mode Control, Half and Full Bridge Converters.

UNIT-IV

Fly back Converter. Introduction to Resonant Converters. Load Resonant Converter. Zero Voltage Switching Clamped Voltage Topologies.

UNIT-V

Resonant DC Link Inverters with Zero Voltage Switching. High Frequency Link Integral Half Cycle Converter.

Modelling and design of DC-DC Converters for various renewable energy conversion. Few power electronic circuits used in practice for controlling electric drives.

TEXT BOOKS

1. Rashid "Power Electronics" Prentice Hall India 2007.
2. G.K.Dubey et.al "Thyristorised Power Controllers" Wiley Eastern Ltd., 2005, 06.
3. Dewan&Straughen "Power Semiconductor Circuits" John Wiley & Sons., 1975.
4. G.K. Dubey& C.R. Kasaravada "Power Electronics & Drives" Tata McGraw Hill., 1993

REFERENCE BOOKS:

1. Cyril W Lander "Power Electronics" McGraw Hill., 2005.
2. B. K Bose "Modern Power Electronics and AC Drives" Pearson Education (Asia)., 2007
3. Abraham I Pressman "Switching Power Supply Design" McGraw Hill Publishing Company., 2001.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. TECH. PEED I YEAR I SEMESTER

OPTIMAL AND ADAPTIVE CONTROL

(PROGRAM ELECTIVE-I)

Course Code: B4352

L	P	C
3	0	3

UNIT-I:

Optimal control problem – fundamental concepts and theorems of calculus, of variations–Euler - Language equation and extremal of functional.

UNIT-II:

Variational approach to solving optimal control problems. Hamiltonian and different boundary conditions for optimal control problem.

UNIT-III:

Linear regulator problem - Pontryagin's minimum principle.

UNIT-IV:

Dynamic programming - Principle of optimality and its application to optimal control problem.

UNIT-V:

Hamilton-Jacobi-Bellman equation - model reference adaptive systems (MRAS) - Design hypothesis.

TEXT BOOKS:

1. Donald E. Kirk, "Optimal Control Theory, An introduction", Prentice Hall Inc., 2004.
2. A.P. Sage, "Optimum Systems Control", Prentice Hall, 1977.
3. HSU and Meyer, "Modern Control, Principles and Applications", McGraw Hill, 1968.

REFERENCE BOOKS:

1. Yoan D. Landu, "Adaptive Control (Model Reference Approach)", Marcel Dekker. 1981.
2. K.K.D.Young, "Design of Variable Structure Model Following Control Systems", IEEETransactions on Automatic Control, Vol. 23, pp 1079-1085, 1978.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR I SEMESTER

POWER QUALITY (Program Elective-I)

Course Code: B4353

L	P	C
3	0	3

UNIT-I

Introduction-power quality-voltage quality-overview of power, Quality phenomena classification of power quality issues. Power quality measures and standards-THD-TIF-DIN-C-message weights.Flicker factor transient phenomena-occurrence of power quality problems, Power acceptability curves-IEEE guides, Standards and recommended practices.

UNIT-II

Harmonics-individual and total harmonic distortion, RMS value of a harmonic waveform, Triplex harmonics. Important harmonic introducing devices.SMPS, Three phase power converters-arcing devices saturable devices, Harmonic distortion of fluorescent lamps-effect of power system harmonics on power system equipment and loads.

UNIT-III

Modeling of networks and components under non-sinusoidal conditions, Transmission and distribution systems, Shunt capacitors-transformers. Electric machines. Ground systems loads that cause power quality problems. Power quality problems created by drives and its impact on drive..

UNIT-IV

Power factor improvement- Passive Compensation. Passive Filtering. Harmonic Resonance. Impedance Scan Analysis, Active Power Factor Corrected Single Phase Front End Control Methods for Single Phase APFC. Three Phase APFC and Control Techniques, PFC based on Bilateral Single Phase and Three Phase Converter.

UNIT-V

Hamilton-Jacobi-Bellman equation - model reference adaptive systems (MRAS) - Design hypothesis.

TEXT BOOKS:

1. G.T. Heydt, "Electric power quality", McGraw-Hill Professional, 2007.
2. Math H. Bollen, "Understanding Power Quality Problems", IEEE Press, 2000.

REFERENCE BOOKS:

1. J. Arrillaga, "Power System Quality Assessment", John wiley, 2000.
2. J. Arrillaga, B.C. Smith, N.R. Watson & A. R.Wood , "Power system Harmonic Analysis", Wiley,1997.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR I SEMESTER

STATIC VAR CONTROLLERS AND HARMONIC FILTERING

(Program Elective-II)

Course Code: B4354

L	P	C
3	0	3

UNIT-I

Fundamentals of Load Compensation, Steady-State Reactive Power Control in Electric Transmission Systems, Reactive Power Compensation and Dynamic Performance of Transmission Systems.

UNIT-II

Power Quality Issues: Sags, Swells, Unbalance, Flicker, Distortion. Current Harmonics. Sources of Harmonics in Distribution Systems

UNIT-III

Static Reactive Power Compensators and their control. Shunt Compensators. SVCs of Thyristor Switched and Thyristor Controlled types and their control, STATCOMs and their control. Series Compensators of thyristor Switched and Controlled Type and their Control. SSSC and its Control, Sub-Synchronous Resonance and damping. Use of STATCOMs and SSSCs for Transient and Dynamic Stability Improvement in Power System.

UNIT-IV

Converters for Static Compensation. Single Phase and Three Phase Converters and Standard Modulation Strategies (Programmed Harmonic Elimination and SPWM). GTO Inverters. Multi-Pulse Converters and Interface Magnetics. Multi-Level Inverters of Diode Clamped Type and Flying Capacitor Type and suitable modulation strategies (includes SVM). Multi-level inverters of Cascade Type and their modulation. Current Control of Inverters

UNIT-V

Passive Harmonic Filtering, Single Phase Shunt Current Injection Type Filter and its Control. Three Phase Three-wire Shunt Active Filtering and their control using p-q theory and d-q modeling. Three phase four wire shunt active filters. Hybrid Filtering using Shunt Active Filters. Dynamic Voltage Restorer and its control. Power Quality Conditioner

TEXT BOOKS:

1. Ned Mohan et.al, "Power Electronics", John Wiley and Sons, 2006.
2. G. Massobrio, P. Antognet, "Semiconductor Device Modeling with Spice", McGraw-Hill, Inc., 1988.

REFERENCE BOOKS:

1. B. J. Baliga, "Power Semiconductor Devices", Thomson, 2004.
2. V. Benda, J. Gowar, D. A. Grant, "Power Semiconductor Devices. Theory and Applications", John Wiley & Sons 1994.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR I SEMESTER

PWM CONVERTER AND APPLICATIONS

(Program Elective-II)

Course Code: B4355

L	P	C
3	0	3

UNIT-I

AC/DC and DC/AC power conversion, Overview of applications of voltage source converters and current source converters.

UNIT-II

Pulse width modulation techniques for bridge converters Bus clamping PWM. Space vector based PWM. Advanced PWM techniques.

UNIT-III

Practical devices in converter. Calculation of switching and conduction power losses.

UNIT-IV

Compensation for dead time and DC voltage regulation. Dynamic model of PWM converter. Multilevel converters. Constant V/F induction motor drives.

UNIT-V

Estimation of current ripple and torque ripple in inverter fed drives. Line-side converters with power factor compensation.

Active power filtering. Reactive power compensation. Harmonic current compensation. Selective harmonic elimination PWM technique for high power electric drives.

TEXT BOOKS:

1. Mohan, Undeland and Robbins, "Power Electronics: Converters, Applications and Design", John's Wiley and Sons.
2. Erickson RW, "Fundamentals of Power Electronics", Chapman and Hall.

REFERENCE BOOKS:

1. Vithyathil. J, "Power Electronics: Principles and Applications", McGraw Hill.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I YEAR I SEMESTER

POWER SEMI CONDUCTOR DEVICES & MODELLING
(Program Elective-II)

Course Code: B4356

L	P	C
3	0	3

UNIT-I

Energy auditing: Types and objectives, Audit instruments- ECO assessment and Economic methods specific energy analysis. Minimum energy paths-consumption models-Case study.

UNIT-II

Electric Motors-Energy efficient controls and starting Efficiency. Motor Efficiency and Load Analysis. Energy efficient /high efficient Motors-Case study. Load Matching and selection of motors. Variable speed drives. Pumps and Fans-Efficient Control strategies. Optimal selection and sizing. Optimal operation and Storage: Case study

UNIT-III

Transformer Loading/Efficiency analysis. Feeder/cable loss evaluation: Case study. Reactive Power Management. Capacitor Sizing-Degree of compensation. Capacitor losses-Location-Placement Maintenance, Case study.

UNIT-IV

Peak Demand controls- Methodologies. Types of Industrial loads-Optimal Load Scheduling-case study. Lighting-Energy efficient light sources. Energy conservation in Lighting Schemes. Electronic ballast-Power quality issues. Uminaries: case study

UNIT-V

Cogeneration-types and Schemes. Optimal operation of cogeneration plants-case study. Electric loads of Air conditioning & Refrigeration. Energy conservation measures. Cool storage. Types-optimal operation case study. Electric water heating, Gysers, Solar Water Heaters Power Consumption in Compressors. Energy conservation measures.

TEXT BOOKS:

1. Giovanni Petrecca, "Industrial Energy Management: Principles and Applications", The Kluwer international series -207, 1999.
2. Anthony J. Pansini, Kenneth D. Smalling, "Guide to Electric Load Management", Pennwell Pub; (1998).

REFERENCE BOOKS:

1. Handbook on Energy Audit and Environment Management, Y P Abbi and Shashank Jain, TERI, 2006.
2. Handbook of Energy Audits Albert Thumann, William J. Younger, Terry Niehus, 2009.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR II SEMESTER

SWITCHED MODE AND RESONANT CONVERTERS

(Program Elective-III)

Course Code: B4357

L	P	C
3	0	3

UNIT - I

Buck, Boost, Buck-Boost SMPS Topologies. Basic Operation-Waveforms - modes of operation -switching stresses. Switching and conduction losses. Optimum switching frequency. Practical voltage, current and power limits - design relations. Voltage mode control principles. Push-Pull and Forward Converter Topologies - Basic Operation, waveforms. Flux Imbalance Problem and Solutions.

UNIT - II

Transformer Design. Output Filter Design. Switching Stresses and Losses. Forward Converter Magnetics. Voltage Mode Control. Half and Full Bridge Converters. Basic Operation and Waveforms. Magnetics, Output Filter, Flux Imbalance, Switching Stresses and Losses, Power Limits, Voltage Mode Control.

UNIT - III

Classification of Resonant Converters. Basic Resonant Circuit Concepts. Load Resonant Converter, Resonant Switch Converter, Zero Voltage Switching Clamped Voltage Topologies. Resonant DC Link Inverters with Zero Voltage Switching. High Frequency Link Integral Half Cycle Converter. Fly back Converter-discontinuous mode operation, waveforms, control. Magnetics- Switching Stresses and Losses, Disadvantages – Continuous. Mode Operation, waveforms, control, design relations.

UNIT - IV

Voltage Mode Control of SMPS- Loop Gain and Stability Considerations. Error Amp- frequency Response and Transfer Function. Trans-conductance Current Mode Control of SMPS. Current Mode Control Advantages, Current Mode Vs Voltage Mode.

UNIT - V

Current Mode Deficiencies. Slope Compensation. Study of a typical Current Mode PWM Control IC UC3842. Modeling of SMPS. Small Signal Approximation- General Second Order Linear Equivalent Circuits. Study of popular PWM Control ICs (SG 3525, TL 494, MC34060 etc.)

TEXT BOOKS:

1. Abraham I Pressman, "Switching Power Supply Design," McGraw Hill Publishing Company, 2001.
2. Daniel M Mitchell, "DC-DC Switching Regulator Analysis," McGraw Hill Publishing Company-1988.

REFERENCE BOOKS:

1. Ned Mohan et.al, "Power Electronics," John Wiley and Sons 2006.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I YEAR II SEMESTER

INDUSTRIAL LOAD MODELING AND CONTROL
(Program Elective-III)

Course Code: B4358

L	P	C
3	0	3

UNIT – I

Electric Energy Scenario-Demand Side Management-Industrial Load Management. Load Curves-Load Shaping Objectives-Methodologies. Barriers; Classification of Industrial Loads- Continuous and Batch processes -Load Modeling.

UNIT – II

Electricity pricing – Dynamic and spot pricing –Models. Direct load control- Interruptible load control. Bottom up approach- scheduling- Formulation of loadmodels- Optimization and control algorithms - Case studies.

UNIT – III

Reactive power management in industries-controls-power quality impactsapplication of filters Energy saving in industries.

UNIT – IV

Cooling and heating loads- load profiling- Modeling. Cool storage-Types- Control strategies. Optimal operation- Problem formulation- Case studies.

UNIT – V

Captive power units- Operating and control strategies- Power Pooling-Operation models. Energy banking- Industrial Cogeneration

Selection of Schemes Optimal Operating Strategies. Peak load saving-Constraints-Problem formulation- Case study. Integrated Load management for Industries

TEXT BOOKS

1. C.O. Bjork "Industrial Load Management - Theory, Practice and Simulations", Elsevier, theNetherlands,1989.
2. C.W. Gellings and S.N. Talukdar, "Load management concepts," IEEE Press, New York, 1986,pp. 3-28.
3. Y. Manichaikul and F.C. Schweppe," Physically based Industrial load", IEEE Trans. on PAS, April 1981.

REFERENCE BOOKS:

1. H. G. Stoll, "Least cost Electricity Utility Planning", Wiley Interscience Publication, USA, 1989.5. I.J.Nagarath and D.P.Kothari, .Modern Power System Engineering., Tata McGraw Hillpublishers, New Delhi, 1995.
2. IEEE Bronze Book- "Recommended Practice for Energy Conservation and cost effectiveplanningin Industrial facilities", IEEE Inc, USA.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR II SEMESTER

ADVANCED DIGITAL SIGNAL PROCESSING

(Program Elective-III)

Course Code: B4359

L	P	C
3	0	3

UNIT - I

Discrete time signals Linear shift invariant systems- Stability and causality Sampling of continuous time signals-Discrete time Fourier transform- Discrete Fourier series- Discrete Fourier transform Z transform- Properties of different transforms

UNIT - II

Linear convolution using DFT Computation of DFT Design of IIR digital filters from analog filters Impulse invariance method Bilinear transformation method.

UNIT - III

FIR filter design using window functions Comparison of IIR and FIR digital filters Basic IIR and FIR filter realization structures Signal flow graph representations Quantization process and errors Coefficient quantisation effects in IIR and FIR filters

UNIT - IV

A/D conversion noise- Arithmetic round-off errors Dynamic range scaling Overflow oscillations and zeroInput limit cycles in IIR filters Linear Signal Models

UNIT - V

All pole, All zero and Pole-zero models Power spectrum estimation- Spectral analysis of deterministic signals. Estimation of power spectrum of stationary random signals.

Optimum linear filters Optimum signal estimation Mean square error estimation Optimum FIR and IIR Filters

TEXT BOOKS

1. Sanjit K Mitra, "Digital Signal Processing: A computer-based approach", TataMc Grow-Hill Edition 1998.

REFERENCE BOOKS:

1. Dimitris G .Manolakis, Vinay K. Ingle and Stephen M. Kogon, "Statistical and Adaptive Signal Processing", Mc Grow Hill international editions.-2000.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I YEAR II SEMESTER

ADVANCED MICRO-CONTROLLER BASED SYSTEMS
(Program Elective-IV)

Course Code: **B4360**

L	P	C
3	0	3

UNIT – I

Basic Computer Organization. Accumulator based processes-Architecture-Memory Organization-I/O Organization

UNIT – II

Micro-Controllers-Intel 8051, Intel 8056- Registers, Memories. I/O Ports, Serial Communication. Timers, Interrupts, Programming.

UNIT – III

Intel 8051 – Assembly language programming-Addressing-Operations-Stack & Subroutines, Interrupts-DMA.

UNIT – IV

PIC 16F877- Architecture Programming. Interfacing Memory/ I/O Devices, Serial I/O and data communication.

UNIT – V

Digital Signal Processor (DSP) - Architecture – Programming, Introduction to FPGA

Microcontroller development for motor control applications. Stepper motor control using micro controller.

TEXT BOOKS:

1. *John.F.Wakerly: "Microcomputer Architecture and Programming", John Wiley and Sons 1981.*
2. *Ramesh S.Gaonker: "Microprocessor Architecture, Programming and Applications with the8085", Penram International Publishing (India), 1994.*
3. *Raj Kamal: "The Concepts and Features of Microcontrollers", Wheeler Publishing, 2005.*
4. *Kenneth J. Ayala, "The 8051 microcontroller", Cengage Learning, 2004.*

REFERENCE BOOKS:

1. *John Morton," The PIC microcontroller: your personal introductory course", Elsevier, 2005.*
2. *Dogan Ibrahim," Advanced PIC microcontroller projects in C: from USB to RTOS with thePIC18F Series", Elsevier, 2008.*
3. *Microchip datasheets for PIC16F877.*

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR II SEMESTER

DISTRIBUTED GENERATION

(Program Elective-IV)

Course Code: B4361

L	P	C
3	0	3

UNIT – I

Need for Distributed generation. Renewable sources in distributed generation and current scenario in Distributed Generation.

UNIT – II

Planning of DGs. Siting and sizing of DGs optimal placement of DG sources in distribution systems. Grid integration of DGs Different types of interfaces, Inverter based DGs and rotating machine based interfaces. Aggregation of multiple DG units.

UNIT – III

Technical impacts of DGs. Transmission systems Distribution Systems De-regulation Impact of DGs upon protective relaying. Impact of DGs upon transient and dynamic stability of existing distribution systems, Steady-state and Dynamic analysis.

UNIT – IV

Economic and control aspects of DGs Market facts. Issues and challenges Limitations of DGs, Voltage control techniques. Reactive power control, Harmonics Power quality issues, Reliability of DG based systems.

UNIT – V

Introduction to micro-grids. Types of micro-grids: autonomous and non-autonomous grids Sizing of micro-grids. Modeling & analysis of Micro-grids with multiple DGs. Micro-grids with power electronic interfacing units.

TEXT BOOKS

1. H. Lee Willis, Walter G. Scott, "Distributed Power Generation – Planning and Evaluation", Marcel Decker Press.
2. M. Godoy Simoes, Felix A. Farret, "Renewable Energy Systems – Design and Analysis with Induction Generators", CRC press.

REFERENCE BOOKS:

1. Stuart Borlase. "Smart Grid: Infrastructure Technology Solutions" CRC Press.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I YEAR II SEMESTER

SMART GRIDS (Program Elective-IV)

Course Code: B4362

L	P	C
3	0	3

UNIT – I

Introduction to Smart Grid, Evolution of Electric Grid. Concept of Smart Grid, Definitions, Need of Smart Grid. Concept of Robust & Self-Healing Grid, Present development & International policies in Smart Grid

UNIT – II

Introduction to Smart Meters, Real Time Pricing, Smart Appliances. Automatic Meter Reading (AMR). Outage Management System (OMS). Plug in Hybrid Electric Vehicles (PHEV). Vehicle to Grid, Smart Sensors. Home & Building Automation, Smart Substations, Substation Automation, Feeder Automation

UNIT – III

Geographic Information System (GIS). Intelligent Electronic Devices (IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro. Compressed Air Energy Storage. Wide Area Measurement System (WAMS), Phase Measurement Unit (PMU).

UNIT – IV

Concept of micro-grid, need & applications of micro-grid. Formation of micro-grid, Issues of interconnection. Protection & control of micro-grid. Plastic & Organic solar cells, Thin film solar cells. Variable speed wind generators, fuel-cells, micro-turbines. Captive power plants, Integration of renewable energy sources.

UNIT – V

Power Quality & EMC in Smart Grid. Power Quality issues of Grid connected Renewable Energy Sources. Power Quality Conditioners for Smart Grid. Web based Power Quality monitoring, Power Quality Audit

TEXT BOOKS:

1. Ali Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE, 2011.
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press, 2009.
3. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, "Smart Grid: Technology and Applications", Wiley 2012.

REFERENCE BOOKS:

1. Stuart Borlas'e, "Smart Grid: Infrastructure, Technology and solutions "CRC Press.
2. A.G. Phadke, "Synchronized Phasor Measurement and their Applications", Springer.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED II YEAR I SEMESTER

SCADA SYSTEM AND APPLICATIONS
(Program Elective-V)

Course Code: **B4363**

L	P	C
3	0	3

UNIT - I

Introduction to SCADA: Data acquisition systems, Evolution of SCADA, Communication technologies.

UNIT - II

Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries SCADA

UNIT - III

Industries SCADA System Components: Schemes- Remote Terminal Unit (RTU), Intelligent Electronic Devices (IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI Systems

UNIT - IV

SCADA Architecture: Various SCADA architectures, advantages and disadvantages of each system - single unified standard architecture –IEC 61850.

UNIT - V

SCADA Communication: various industrial communication technologies -wired and wireless methods and fiber optics. open standard communication protocols.

TEXT BOOKS

1. *Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of America Publications, USA, 2004.*
2. *Gordon Clarke, Deon Reynders: "Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems", Newnes Publications, Oxford, UK, 2004.*
3. *William T. Shaw, "Cybersecurity for SCADA systems", PennWell Books, 2006.*

REFERENCE BOOKS:

1. *David Bailey, Edwin Wright, "Practical SCADA for industry", Newnes, 2003.*
2. *Wiebe, "A guide to utility automation: AMR, SCADA, and IT systems for electric power", PennWell 1999*

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED II YEAR I SEMESTER

FACTS AND CUSTOM POWER DEVICES
(Program Elective-V)

Course Code: B4364

L P C
3 0 3

UNIT – I

Reactive power flow control in Power Systems – Control of dynamic power unbalances in Power System. Power flow control -Constraints of maximum transmission line loading – Benefits of FACTS Transmission line compensation. Uncompensated line -Shunt compensation - Series compensation –Phase angle control. Reactive power compensation. Shunt and Series compensation principles – Reactive compensation at transmission and distribution level.

UNIT - II

Static versus passive VAR compensator, Static shunt compensators: SVC and STATCOM - Operation and control of TSC, TCR and STATCOM - Compensator control. Comparison between SVC and STATCOM.

UNIT – III

Static series compensation: TSSC, SSSC -Static voltage and phase angle regulators – TCVR and TCPAR Operation and Control –Applications, Static series compensation – GCSC,TSSC, TCSC and Static synchronous. series compensators and their Control.

UNIT – IV

SSR and its damping Unified Power Flow Controller: Circuit Arrangement, Operation and control of UPF. Basic Principle of P and Q control- Independent real and reactivepower flow control- Applications.

UNIT – V

Introduction to interline power flow controller. Modeling and analysis of FACTS Controllers – Simulation of FACTS controllers Power quality problems in distribution systems, harmonics.Loads that create harmonics, modeling, harmonic propagation, series and parallel resonances, mitigation of harmonics, passive filters, active filtering – shunt , series and hybrid and their control.

TEXT BOOKS:

1. K R Padiyar, "FACTS Controllers in Power Transmission and Distribution", NewAgeInternationalPublishers, 2007.
2. X P Zhang, C Rehtanz, B Pal, "Flexible AC Transmission Systems- ModellingandControl",SpringerVerlag, Berlin, 2006.
3. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.

REFERENCE BOOKS:

1. K.S.Sureshkumar, S.Ashok , "FACTS Controllers & Applications", E-book edition, NalandaDigital Library, NIT Calicut, 2003.
2. G. T.Heydt, "Power Quality", McGraw-Hill Professional, 2007.
3. T. J. E. Miller, "Static Reactive Power Compensation", John Wiley and Sons, Newyork, 1982.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED II YEAR I SEMESTER

High Voltage DC Transmission
(Program Elective-V)

Course Code: B4365

L	P	C
3	0	3

UNIT – I

Development of HVDC Technology, DC versus AC Transmission, Selection of converter configuration.

UNIT – II

Rectifier and Inverter operation, Digital Simulation of converters, Control of HVDC converters and Systems.

UNIT – III

Individual phase control, Equidistant firing controls, Higher level controls. Characteristics and non-characteristics harmonics filter design. Fault development and protection.

UNIT – IV

Interaction between AC-DC power systems. Over voltages on AC/DC side, multi-terminal HVDC systems, control of MTDC systems.

UNIT – V

Modelling of HVDC systems, per unit system, Representation for power flow solution, representation for stability studies.

TEXT BOOKS

1. J. Arrillaga, "High Voltage Direct Transmission", Peter Peregrinus Ltd. London, 1983.
2. K. R. Padiyar, "HVDC Power Transmission Systems", Wiley Eastern Ltd., 1990.

REFERENCE BOOKS:

1. E. W. Kimbark, "Direct Current Transmission", Vol. I, Wiley Interscience, 1971.
2. Erich Uhlmann, "Power Transmission by Direct Current", B.S. Publications, 2004.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M Tech. PEED II YEAR ISEMESTER

BUSINESS ANALYTICS
(OPEN ELECTIVE)

Course Code: B4901

L P C
3 0 3

UNIT - I

BUSINESS ANALYTICS: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

UNIT - II

TRENDINESS AND REGRESSION ANALYSIS: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

UNIT - III

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

UNIT - IV

FORECASTING TECHNIQUES: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

UNIT - V

DECISION ANALYSIS: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

TEXT BOOKS

1. *Business analytics Principles, Concepts, and Applications* by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. *Business Analytics* by James Evans, persons Education.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M Tech. PEED II YEAR I SEMESTER

INDUSTRIAL SAFETY
(OPEN ELECTIVE)

Course Code: B4902

L T C
3 0 3

UNIT - I

INDUSTRIAL SAFETY: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT - II

FUNDAMENTALS OF MAINTENANCE ENGINEERING: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT - III

WEAR AND CORROSION AND THEIR PREVENTION: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT - IV

FAULT TRACING: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT - V

PERIODIC AND PREVENTIVE MAINTENANCE: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

TEXT BOOKS

1. *Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.*
2. *Maintenance Engineering, H. P. Garg, S. Chand and Company.*

REFERENCE BOOKS:

1. *Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.*
2. *Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.*

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M Tech. PEED II YEAR ISEMESTER

OPERATIONS RESEARCH
(OPEN ELECTIVE)

Course Code: B4903

L P C
3 0 3

UNIT - I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

UNIT - II

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

UNIT - III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT - IV

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT - V

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

TEXT BOOKS:

1. H.A. Taha, *Operations Research, An Introduction*, PHI, 2008
2. H.M. Wagner, *Principles of Operations Research*, PHI, Delhi, 1982.

REFERENCE BOOKS:

1. J.C. Pant, *Introduction to Optimisation: Operations Research*, Jain Brothers, Delhi, 2008
2. Hitler Libermann *Operations Research: McGraw Hill Pub. 2009*
3. Pannerselvam, *Operations Research: Prentice Hall of India 2010*
4. Harvey M Wagner, *Principles of Operations Research: Prentice Hall of India 2010*

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M Tech. PEED II YEAR I SEMESTER

WASTE TO ENERGY
(OPEN ELECTIVE)

Course Code: B4904

L P C
3 0 3

UNIT - I

INTRODUCTION TO ENERGY FROM WASTE: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT - II

BIOMASS PYROLYSIS: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT - III

BIOMASS GASIFICATION: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers - Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT - IV

BIOMASS COMBUSTION: Biomass stoves – Improved chullahs, types, some exotic designs, fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT - V

BIOGAS: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

TEXT BOOKS:

1. *Non Conventional Energy*, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. *Biogas Technology - A Practical Hand Book* - Khandelwal, K. C. and Mahdi, S. S., Vol. I &II, Tata McGraw Hill Publishing Co. Ltd., 1983.

REFERENCE BOOKS:

1. *Food, Feed and Fuel from Biomass*, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
2. *Biomass Conversion and Technology*, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M Tech. PEED I YEAR I /II SEMESTER

ENGLISH FOR RESEARCH PAPERS WRITING
(AUDIT COURSE)

Course Code: B4911

L P C
2 0 0

UNIT - I

Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

UNIT - II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

UNIT - III

Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

UNIT - IV

Key skills are needed when writing a Title, key skills are needed when writing an abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.

UNIT - V

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, and skills are needed when writing the Conclusions

TEXT BOOKS:

1. Goldbort R (2006) *Writing for Science*, Yale University Press (available on Google Books)
2. Day R (2006) *How to Write and Publish a Scientific Paper*, Cambridge University Press

REFERENCE BOOKS:

1. Highman N (1998), *Handbook of Writing for the Mathematical Sciences*, SIAM. Highman's book .
2. Adrian Wallwork , *English for Writing Research Papers*, Springer New York Dordrecht Heidelberg London, 2011

VARDHAMAN COLLEGE OF ENGINEERING
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M Tech. PEED I YEAR I /II SEMESTER

DISASTER MANAGEMENT
(AUDIT COURSE)

Course Code: B4912

L P C
2 0 0

UNIT - I

INTRODUCTION DISASTER: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT - II

REPERCUSSIONS OF DISASTERS AND HAZARDS: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT - III

DISASTER PRONE AREAS IN INDIA: Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides and Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT - IV

DISASTER PREPAREDNESS AND MANAGEMENT: Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data From Meteorological and other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT - V

DISASTER RISK: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

TEXT BOOKS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.

REFERENCE BOOKS:

1. Goel S. L. , *Disaster Administration And Management Text And Case Studies* ,Deep &Deep Publication Pvt. Ltd., New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M Tech. PEED I YEAR I /II SEMESTER

SANSKRIT FOR TECHNICAL KNOWLEDGE
(AUDIT COURSE)

Course Code: B4913

L P C
2 0 0

UNIT - I

Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences.

UNIT - II

Order Introduction of roots Technical information about Sanskrit Literature

UNIT - III

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics.

TEXT BOOKS:

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" PrathamaDeeksha-VempatiKutumbshastri, Rashtriya SanskritSansthanam, New Delhi Publication

REFERENCE BOOKS:

1. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M Tech. PEED I YEAR I /II SEMESTER

VALUE EDUCATION
(AUDIT COURSE)

Course Code: B4914

L P C
2 0 0

UNIT - I

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgements.

UNIT - II

Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

UNIT - III

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.

UNIT - IV

Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.

TEXT BOOKS:

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M Tech. PEED I YEAR I /II SEMESTER

CONSTITUTION OF INDIA
(AUDIT COURSE)

Course Code: B4915

L P C
2 0 0

UNIT - I

HISTORY OF MAKING OF THE INDIAN CONSTITUTION: Drafting Committee, (Composition & Working).

UNIT - II

PHILOSOPHY OF THE INDIAN CONSTITUTION: Preamble, Salient Features

UNIT - III

CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy Fundamental Duties.

UNIT - IV

ORGANS OF GOVERNANCE: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT - V

LOCAL ADMINISTRATION: District's Administration head, Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

TEXT BOOKS:

1. *The Constitution of India, 1950 (Bare Act), Government Publication.*
2. *Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.*

REFERENCE BOOKS

1. *M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.*
2. *D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.*

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M Tech. PEED I YEAR I /II SEMESTER

PEDAGOGY STUDIES
(AUDIT COURSE)

Course Code: B4916

L P C
2 0 0

UNIT - I

INTRODUCTION AND METHODOLOGY: Aims and rationale, Policy background, Conceptual framework and terminology. Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.

UNIT - II

THEMATIC OVERVIEW: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

UNIT - III

EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES, METHODOLOGY FOR THE IN DEPTH STAGE: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT - IV

PROFESSIONAL DEVELOPMENT: alignment with classroom practices and follow up support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes

UNIT - V

RESEARCH GAPS AND FUTURE DIRECTIONS: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

TEXT BOOKS:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, *Compare*, 31 (2):245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, *Journal of Curriculum Studies*, 36 (3): 361-379.

REFERENCE BOOKS:

1. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
2. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? *International Journal Educational Development*, 33 (3): 272-282.
3. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.

VARDHAMAN COLLEGE OF ENGINEERING
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M Tech. PEED I YEAR I /II SEMESTER

STRESS MANAGEMENT BY YOGA
(AUDIT COURSE)

Course Code: B4917

L P C
2 0 0

UNIT - I

Definitions of Eight parts of yoga. (Ashtanga)

UNIT - II

Yam and Niyam.

Do`s and Don`ts in life.

i) Ahimsa, satya, astheya, bramhacharya and aparigraha, ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT - III

Asan and Pranayam

i) Various yoga poses and their benefits for mind & body, ii) Regularization of breathing techniques and its effects-Types of pranayam

REFERENCE BOOKS:

1. *‘Yogic Asanas for Group Tarining-Part-I’ :Janardan Swami YogabhyasiMandal, Nagpur*
2. *“Rajayoga or conquering the Internal Nature” by Swami Vivekananda, AdvaitaAshrama(Publication Department), Kolkata.*

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M Tech. PEED I YEAR I /II SEMESTER

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS
(AUDIT COURSE)

Course Code: B4918

L P C
2 0 0

UNIT - I

NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY: Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism),Verses- 26,28,63,65 (virtue), Verses- 52,53,59 (dont's),Verses- 71,73,75,78 (do's).

UNIT - II

APPROACH TO DAY TO DAY WORK AND DUTIES: ShrimadBhagwadGeeta: Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17,23, 35,Chapter 18-Verses 45, 46, 48.

UNIT - III

STATEMENTS OF BASIC KNOWLEDGE: ShrimadBhagwadGeeta: Chapter2-Verses 56, 62, 68, Chapter 12 - Verses 13, 14, 15, 16,17, 18, Personality of Role model. ShrimadBhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36, 37, 42, Chapter 4-Verses 18, 38,39 , Chapter18 - Verses 37,38,63

REFERENCE BOOKS:

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.