



VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC and ISO 9001:2008 Certified
Shamshabad - 501 218, Hyderabad, Telangana State, India.
www.vardhaman.org

MASTER OF TECHNOLOGY

POWER ELECTRONICS AND ELECTRICAL DRIVES

CHOICE BASED CREDIT SYSTEM

ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABI FOR
M.TECH.- POWER ELECTRONICS AND ELECTRICAL DRIVES
UNDER AUTONOMOUS STATUS
FOR THE BATCHES ADMITTED FROM THE ACADEMIC YEAR 2015 - 2016

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.

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” the 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.Degree program in Computer Science and Engineering, M.Tech.Degree program in Embedded Systems 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, B3201:Principles of Machine Modeling Analysis, B3601:Microcontrollers for Embedded System Design, etc.

Table1: Course Code Description

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

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

FOREWORD

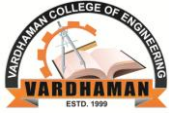
The autonomy is conferred on **Vardhaman College of Engineering** by JNTUH based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like UGC and AICTE. It reflects the confidence of the affiliating University 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 Boards of Studies are constituted with 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 prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the college to order to produce a quality engineering graduate to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications 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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VISION OF THE COLLEGE:

To aim at inculcating the spirit of high ambitions, healthy attitudes, discipline and multidimensional excellence in the students and strive to mould them to scale new heights and get their mental horizons enlarged through value-based technical education and congenial study environment.

MISSION OF THE COLLEGE:

To sharpen the inherent professional skills of our students to enable them compete in the complex world through our newly evolved quality management system and dedicated staff. The practical oriented education and the research tie-up with industries we provide, tend to promote the intellectual pursuits of the students.

QUALITY POLICY:

Vardhaman College of Engineering strives to establish a system of quality assurance to continuously address, monitor and evaluate the quality of education offered to students, thus promoting effective teaching processes for the benefit of students and making the College a Centre of Excellence for Engineering and Technological studies.

GOALS:

1. To initiate strategic planning process to review its present plans and goals in identifying thrust areas.
2. To tie up with national and international premier organizations for the purpose of exchange of research and innovation through the students and faculty of the Institution.
3. To develop consultancy in all disciplines through alliances with research organizations, government establishments, industries and alumni.
4. To attain status as the provider of quality education and independent research center.
5. To evolve as a Deemed University offering programs of relevance in emerging areas of technology.
6. To achieve 100% placement for students.



VARDHAMAN COLLEGE OF ENGINEERING (AUTONOMOUS)

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ACADEMIC REGULATIONS

M.Tech. Regular Two Year Post-Graduate Programme

(For the batches admitted from the Academic Year 2015–2016)

For pursuing Two year PG program of study in Master of Technology (M.Tech.) offered by Vardhaman College of Engineering under Autonomous status and herein after 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 2015-2016 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	Intake
1	Computer Science and Engineering	18
2	Digital Electronics and Communication Systems	18
3	Embedded Systems	18
4	Power Electronics and Electrical Drives	18

4. ADMISSION

4.1. Admission into first year of two Years 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 PG CET examination conducted by Telangana State Council for Higher Education (or) GATE examination for allotment of a seat by the Convener, PG CET 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, PG CET.
- (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 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. The academic calendar is shown in Table 1 is declared at the start of the semester. The duration for each semester shall be a minimum of 16 weeks of instruction.

Table 1: Academic Calendar

FIRST 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
SECOND SEMESTER (21 weeks)	Instruction Period :16 weeks	18 weeks
	Mid Semester Tests :2 weeks	
	Preparation & Practical Examinations	1 weeks
	External Examinations	2 weeks
Summer Vacation		4 weeks
THIRD SEMESTER	Project Work Phase – I	18 Weeks
FOURTH SEMESTER	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 5 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 three (or more) period hours of practical
 - 2 credits for technical seminar
 - 4 credits for comprehensive viva examination
 - 18 credits for project work phase – I
 - 22 credits for project work phase – II
- 8.2.** The two year curriculum of any M.Tech programme of study shall have total of 88 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.
- 8.3.** For courses like technical seminar / comprehensive viva / Project Work Phases – I and II, where formal contact hours are not specified, credits are assigned based on the complexity of the work to be carried out.

9. METHOD OF EVALUATION

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

9.1. Theory

For all lecture based theory courses, the evaluation shall be for **30** marks through internal evaluation and **70** marks through external end semester examination of three hours duration.

9.1.1 Internal evaluation

For theory subjects, during the semester there shall be 2 midterm examinations. Each midterm examination consists of subjective test. The subjective test is for **30** marks, with duration of 2 hours.

First midterm examination shall be conducted for I – IV units of syllabus and second midterm examination shall be conducted for the remaining portion.

The internal marks shall be computed as the average of the two internal evaluations, of two subjective tests.

9.1.2 External Evaluation

The question paper shall be set externally and valued both internally and externally. The external end semester examination question paper in theory subjects will be for a maximum of **70** marks to be answered in three hours duration. For End-Semester examination, the candidate has to answer any five out of eight questions. Each question carries **14** marks. Each theory course shall consist of eight units of syllabus.

The question paper shall be set externally and evaluated both internally and externally. If the difference between the first and second valuation is less than 15 marks, the average of the two valuations shall be awarded, and if the difference between the first and second valuation is more than or equal to 15 marks, third evaluation will be conducted and the average marks given by all three examiners shall be awarded as final marks.

9.2. Practical

Practical shall be evaluated for **100** marks, out of which **70** marks are for external examination and **30** marks are for internal evaluation. The **30** internal marks are distributed as **20** marks for day-to-day work and **10** marks for internal examination. The external end - examination shall be conducted by the teacher concerned and an external examiner from outside the college.

9.3. Technical Seminar

The seminar shall have two components, one chosen by the student from the course-work without repetition and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work. A hard copy of the information on seminar topic in the form of a report is to be submitted for evaluation along with presentation. The presentation of the seminar topics shall be made before an internal evaluation committee comprising the Head of the Department or his nominee, seminar supervisor and a senior faculty of the department. The two components of the seminar are distributed between two halves of the semester and are evaluated for **100** marks each. The average of the two components shall be taken as the final score. A minimum of **50%** of maximum marks shall be obtained to earn the corresponding credits.

9.4. Comprehensive Viva

The comprehensive Viva will be conducted by a committee comprising Head of the Department or his nominee, two senior faculty of the respective department and an external examiner from outside the college. This is aimed at assessing the student's understanding of various subjects studied during the entire program. The comprehensive viva shall be evaluated for **100** marks at the end of III semester. A minimum of **50%** of maximum marks shall be obtained to earn the corresponding credits.

9.5. Project Work

The project work shall be evaluated for **300** marks out of which **100** marks for phase – I internal evaluation, **60** marks for phase – II internal evaluation and **140** marks for end semester evaluation. A minimum of **50%** of marks on the aggregate in the internal evaluation and external end-evaluation taken together shall be obtained to earn the corresponding credits.

Every candidate is required to submit dissertation after taking up a topic approved by the Departmental Committee. The project work shall be spread over in III semester and in IV semester. The project work shall be somewhat innovative in nature, exploring the research bent of mind of the student.

The Departmental Committee (DC) consists of HOD, Supervisor and two senior experts in the department. The committee monitors the progress of Project Work. The DC is constituted by the Principal on the recommendations of the department Head.

Student shall register for the Project work with the approval of Departmental Committee in the III Semester and continue the work in the IV Semester too. The Departmental Committee (DC) shall monitor the progress of the project work. In III Semester, Phase – I of the Project Work is to be completed. A Student has to identify the topic of work, collect relevant Literature, preliminary data, implementation tools / methodologies etc., and perform a critical study and analysis of the problem identified. He shall submit status report in two different phases in addition to oral presentation before the Departmental Committee for evaluation and award of **100** internal marks at the end of Phase – I.

A candidate shall continue the Project Work in IV Semester (Phase – II) and submit a Project report at the end of Phase – II after approval of the Departmental Committee. During Phase – II, the student shall submit status report in two different phases, in addition to oral presentation before the DC. The DC shall evaluate the project for **60** internal marks based on the progress, presentations and quality of work.

A candidate shall be allowed to submit the dissertation only after passing all the courses of I and II semesters with the approval of Departmental Committee not earlier than **40 weeks** from the date of registration of the project work and then take viva-voce examination. The viva-voce examination may be conducted once in three months for all the eligible candidates.

Three copies of the dissertation certified in the prescribed form by the supervisor and HOD shall be presented to the Department and one copy is to be submitted to the Controller of Examinations, VCE and one copy to be sent to the examiner.

The department shall submit a panel of three experts for a maximum of 5 students at a time. However, the examiners for conducting viva-voce examination shall be nominated by the Controller of Examinations, VCE. If the report of the examiner is favorable, viva-voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the dissertation. The board shall jointly evaluate the project work for **140** marks. The candidates who fail in viva-voce examinations shall have to re-appear the viva-voce examination after three months. If he fails again in the second viva-voce examination, the candidate has to re-register for the Project Work.

If a candidate desires to change the topic of the project already chosen during Phase – I, he has to re-register for Project work with the approval of the DC and repeat Phases – I and II. Marks already earned in Phase – I stand cancelled.

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

- 10.1.** 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.
- 10.2.** 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 Committee.
- 10.3.** Shortage of attendance below 65% in aggregate shall in no case be condoned.
- 10.4.** 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.
- 10.5.** 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.
- 10.6.** A stipulated fee shall be payable towards condonation of shortage of attendance to the College.
- 10.7.** 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.

11. 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 **50%** 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 technical seminar and comprehensive viva 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 **88** credits and earn all the **88** credits. Grades obtained in all the 88 credits shall be considered for the award of the class based on aggregate of grades (CGPA).
- v. A student who fails to earn **88** credits as indicated in the course structure within **FOUR** academic years from the year of their admission shall forfeit their seat in M.Tech. programme and their admission stands cancelled.
- vi. 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.

12. EVALUATION

Following procedure governs the evaluation.

- 12.1. Marks for components evaluated internally by the faculty should be submitted to the Controller of Examinations one week before the commencement of the semester-end examinations. The marks for the internal evaluation components will be added to the external evaluation marks secured in the semester-end examinations, to arrive at total marks for any subject in that semester.
- 12.2. Performance in all the courses is tabulated course-wise and will be scrutinized by the Examination Committee and moderation is applied if needed, based on the recommendations of moderation committee and course-wise marks lists are finalized.
- 12.3. Student-wise tabulation is done and student-wise memorandum of marks is generated which is issued to the student.

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.

14. RE-REGISTRATION FOR IMPROVEMENT OF INTERNAL

Following are the conditions to avail the benefit of improvement of internal marks.

- 14.1. The candidate should have completed the course work and obtained examinations results for I & II semesters.
- 14.2. 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.
- 14.3. 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.
- 14.4. In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for the re-registered subjects stand cancelled.

15. RE-EVALUATION

Students shall be permitted for re-evaluation after the declaration of end semester examination results within a stipulated period by paying prescribed fee.

16. 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.

17. 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.

18. AWARD OF DEGREE

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

18.1. Eligibility

A student shall be eligible for the award of M.Tech. Degree, if he fulfills 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.

18.2. 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 4:

Table 4: Declaration of Class is based on CGPA (Cumulative Grade Point Average)

Class Awarded	Grades to be Secured	From the aggregate marks secured from 88 Credits
First Class with Distinction	$\geq 7.75.0$ CGPA	
First Class	$=6.75$ to <7.75 CGPA	
Pass Class	$=6.0$ to <6.75 CGPA	
Fail	Below 5.0 CGPA	

18.3. 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 Second Class, as mentioned in Table 5.

Table 5: Percentage Equivalence of Grade Points (For a 10-Point Scale)

Grade	Grade Points (GP)	Percentage of Marks
O (Outstanding)	10	≥ 80 and above
A+ (Excellent)	9	≥ 70 and < 80
A (Very Good)	8	≥ 60 and <70
B+ (Good)	7	≥ 55 and <60
B (Above Average)	6	≥ 50 and <55
F (Fail)	0	Below 50
AB (Absent)	0	

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.

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

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.

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

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

19. 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.

20. 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.

21. 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.

22. 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.

23. 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.

24. MALPRACTICE PREVENTION COMMITTEE

A malpractice prevention committee shall be constituted to examine and punish the students who does malpractice / behaves indiscipline 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.

25. 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.

26. 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.

27. 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.

28. AWARD OF A RANK UNDER AUTONOMOUS SCHEME

28.1. 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.

28.2. 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.

28.3. 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.

29. CONDUCT AND DISCIPLINE

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

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

29.3. 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.

29.4. 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.

29.5. **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.**

29.6. 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.

29.7. 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.

29.8. 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.

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

30. 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.

31. 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.

COURSE STRUCTURE

M.TECH – POWER ELECTRONICS AND ELECTRICAL DRIVES

REGULATIONS: VCE-R15

I SEMESTER							
Code	Subject	Periods per Week		Credits	Scheme of Examination		
		L	P		Maximum Marks		
					Internal	External	Total
B3301	Principles of Machine Modeling Analysis	3	-	3	30	70	100
B3302	Power Electronic Converters-I	3	-	3	30	70	100
B3303	Power Electronic Control of DC Drives	3	-	3	30	70	100
	Open Elective - I	3	-	3	30	70	100
	Professional Elective - I	3	-	3	30	70	100
	Professional Elective - II	3	-	3	30	70	100
B3304	Power Converters Lab	-	3	2	30	70	100
B3305	Technical Seminar	-	-	2	100	-	100
	TOTAL	18	03	22	310	490	800
II SEMESTER							
Code	Subject	Periods per Week		Credits	Scheme of Examination		
		L	P		Maximum Marks		
					Internal	External	Total
B3306	Power Electronic Converters-II	3	-	3	30	70	100
B3307	Power Electronic Control of AC Drives	3	-	3	30	70	100
B3308	Flexible AC Transmission Systems	3	-	3	30	70	100
	Open Elective - II	3	-	3	30	70	100
	Professional Elective - III	3	-	3	30	70	100
	Professional Elective - IV	3	-	3	30	70	100
B3309	Power Electronics Simulation Lab	-	3	2	30	70	100
B3310	Technical Seminar	-	-	2	100	-	100
	TOTAL	18	03	22	310	490	800
III SEMESTER							
Code	Subject	Periods per Week		Credits	Scheme of Examination		
		L	P		Maximum Marks		
					Internal	External	Total
B3311	Comprehensive Viva	-	-	4	-	100	100
B3312	Project Work Phase – I	-	-	18	100	-	100
	TOTAL	-	-	22	100	100	200
IV SEMESTER							
Code	Subject	Periods per Week		Credits	Scheme of Examination		
		L	P		Maximum Marks		
					Internal	External	Total
B3313	Project Work Phase – II	-	-	22	60	140	200
	TOTAL	-	-	22	60	140	200

MTECH – POWER ELECTRONICS AND ELECTRICAL DRIVES

REGULATIONS: VCE-R15

PROFESSIONAL ELECTIVES			
ELECTIVE - I		ELECTIVE - II	
Code	Subject	Code	Subject
B3351	Advanced Microprocessor and Microcontrollers	B3354	Evolutionary Computation
B3352	Power Semi Conductor Devices	B3355	Energy Conversion Systems
B3353	Distribution Automation	B3356	Optimal Control Systems
ELECTIVE - III		ELECTIVE - IV	
Code	Subject	Code	Subject
B3357	Reliability Engineering	B3360	Programmable Logic Controllers and Applications
B3358	Power Quality	B3361	Reactive Power Compensation and Management
B3359	Modern Control Engineering	B3362	Special Electrical Machines
OPEN ELECTIVE			
B3271	Software Engineering Principles	B3272	Human Computer Interaction
B3273	Computer Graphics Concepts	B3274	Fundamentals Software Testing And Quality Assurance
B3676	System On Chip Architecture	B3678	Internetworking and Internet Protocols
B3677	Cryptography and Computer Security	B3679	Multimedia Communication and Networks
B3476	Telecommunication Switching Systems and Networks	B3478	High Performance Networks
B3477	Mobile Computing Technologies	B3479	Integrated Circuits Fabrication Technology
B3371	Nano Technology Applications to Electrical Engineering	B3372	Solar Energy and Applications
B3373	Industrial Electronics	B3374	Energy Management and Audit
B3901	National Service Scheme (NSS)	B3902	Intellectual Property Rights

SYLLABI

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I SEMESTER

PRINCIPLES OF MACHINE MODELLING ANALYSIS

Course Code: B3301

L	P	C
3	0	3

UNIT - I

BASIC MACHINE THEORY: Magnetically coupled circuits, rotating field theory, operation of Induction motor, equivalent circuit, steady state equations of D.C machines, operation of synchronous motor, power angle characteristics.

UNIT - II

BASIC TWO POLE MACHINE: Two pole machine diagram of various machines, primitive two-axis machine, voltage and current relationship, torque equation.

UNIT - III

MODELING AND ANALYSIS OF DC MACHINES: Mathematical model of separately excited D.C motor, steady state analysis, transient state analysis, sudden application of Inertia load transfer function of separately excited D.C motor, mathematical model of D.C series motor, shunt motor, linearization techniques for small perturbations.

UNIT - IV

TRANSFORMATIONS: Linear transformation, phase transformation (a, b, c to α , β , 0), active transformation (α , β , 0 to d, q).

UNIT - V

REFERENCE FRAME THEORY: Voltage and current equations in stator, rotor reference frame and equation in synchronously rotating frame, torque equation, equations in state space form.

UNIT - VI

MODELING OF THREE PHASE INDUCTION MACHINES: Two axis model, voltage and torque equations in machine variables, voltage and torque equations in arbitrary reference frame, steady state analysis and its operation.

UNIT - VII

DYNAMIC ANALYSIS OF THREE-PHASE INDUCTION MACHINE: Induction machine dynamics during starting and braking, accelerating time, induction machine dynamics during normal operation, equation for dynamical response of the induction motor.

UNIT - VIII

MODELING OF SYNCHRONOUS MACHINE: Two axis representation, voltage and current equation in state space variable forms-torque equation.

TEXT BOOKS:

1. P. S. Bimbra (1995), *Generalized Theory of Electrical Machines*, 5th edition, Khanna publications, New Delhi.
2. D. P. Sengupta, J. B. Lynn (1980), *Electrical Machine Dynamics*, The Macmillan Press, USA.

REFERENCE BOOKS:

1. Vedam Subramanyam (1988), *Thyristor control of Electric Drives*, 2nd Edition, Tata McGraw Hill, New Delhi.
2. P. C. Krause (1980), *Analysis of Electrical Machinery*, 2nd Edition, McGraw Hill, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING (AUTONOMOUS)

M. Tech. PEED I SEMESTER

POWER ELECTRONIC CONVERTERS-I

Course Code: B3302

L P C
3 0 3

UNIT - I

AC VOLTAGE CONTROLLERS: Single phase AC voltage controllers with resistive, resistive inductive and resistive inductive induced EMF loads, AC voltage controllers with PWM Control, effects of source and load inductances, synchronous tap changers, applications, numerical problems.

UNIT - II

THREE PHASE AC VOLTAGE CONTROLLERS: Analysis of controllers with star and delta connected resistive, resistive inductive loads, effects of source and load Inductances, applications, numerical problems.

UNIT - III

CYCLO CONVERTERS: Single phase to single phase cycloconverters, analysis of midpoint and bridge configurations, three phase to three phase cycloconverters, analysis of midpoint and bridge configurations, limitations, advantages, applications, numerical problems, matrix converter.

UNIT - IV

SINGLE PHASE CONVERTERS: Single phase converters, half controlled and fully controlled converters, evaluation of input power factor and harmonic factor, continuous and discontinuous load current, single phase dual converters, power factor improvements, extinction angle control, symmetrical angle control, PWM, single phase sinusoidal PWM, single phase series converters, applications, numerical problems.

UNIT - V

THREE PHASE CONVERTERS : Half controlled and fully controlled converters, evaluation of input power factor and harmonic factor, continuous and discontinuous load current, three phase dual converters, power factor improvements, three phase PWM, twelve pulse converters, applications, numerical problems.

UNIT - VI

DC TO DC CONVERTERS: Analysis of step down and step up DC to DC converters with resistive and resistive inductive loads, switched mode regulators, analysis of buck regulators, boost regulators, buck and boost regulators, Cuk regulators, condition for continuous inductor current and capacitor voltage, comparison of regulators, multi output boost converters, advantages, applications, numerical problems.

UNIT - VII

PULSE WIDTH MODULATED INVERTERS (SINGLE PHASE): Principle of operation, performance parameters, single phase bridge inverter, evaluation of output voltage and current with resistive, inductive and capacitive loads, voltage control of single phase inverters, single PWM, multiple PWM, sinusoidal PWM, modified PWM, phase displacement control, advanced modulation techniques for improved performance, trapezoidal, staircase, stepped, harmonic injection and delta modulation, advantage, application, numerical problems.

UNIT - VIII

PULSE WIDTH MODULATED INVERTERS (THREE PHASE): Three phase inverters, analysis of 180 degree condition for output voltage and current with resistive, inductive loads, analysis of 120 degree conduction, voltage control of three phase inverters, sinusoidal PWM, third harmonic PWM, 60 degree PWM, space vector modulation, comparison of PWM techniques, harmonic reductions, current source inverter, variable D.C. link inverter, boost inverter, buck and boost inverter, inverter circuit design, advantages, applications, numerical problems.

TEXT BOOKS:

1. Mohammed H. Rashid (2004), *Power Electronics- circuits, devices, and applications*, 3rd Edition, Prentice Hall of India, New Delhi.
2. Ned Mohan, Tore M. Undeland, William P. Robbins (2003), *Power Electronics- converters, applications, and design*, 2nd Edition, John Wiley & Sons, USA.

REFERENCE BOOKS:

1. Milliman Shepherd, Lizang (2004), *Power converters circuits*, 2nd Edition, CRC Press, USA.
2. M. H. Rashid (2001), *Power electronics hand book*, 3rd Edition, John Wiley & Sons, New York.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I SEMESTER

POWER ELECTRONIC CONTROL OF DC DRIVES

Course Code: B3303

L	P	C
3	0	3

UNIT - I

CONTROLLED BRIDGE RECTIFIER (1- Φ) WITH DC MOTOR LOAD: Separately excited DC motors with rectified singlephase supply, single phase semi converter and single phase full converter for continuous and discontinuous modes of operation, power and power factor.

UNIT - II

CONTROLLED BRIDGE RECTIFIER (3- Φ) WITH DC MOTOR LOAD: Three phase semi converter and three phase full converter for continuous and discontinuous modes of operation, power and power factor, addition of free wheeling diode, three phase double converter.

UNIT - III

THREE PHASE NATURALLY COMMUTATED BRIDGE CIRCUIT AS A RECTIFIER OR AS AN INVERTER: Three phase controlled bridge rectifier with passive load impedance, resistive load and ideal supply, highly inductive load and ideal supply for load side and supply side quantities, shunt capacitor compensation, three phase controlled bridge rectifier inverter.

UNIT - IV

PHASE CONTROLLED DC MOTOR DRIVES: Three phase controlled converter, control circuit, control modeling of three phase converter, steady state analysis of three phase converter control DC motor drive, two quadrant, three phase converter controlled DC motor drive, DC motor and load converter.

UNIT - V

CURRENT AND SPEED CONTROLLED DC MOTOR DRIVES: Current and speed controllers, current and speed feedback, design of controllers, current and speed controllers, motor equations, filter in the speed feedback loop speed controller, current reference generator, current controller and flow chart for simulation, harmonics and associated problems, sixth harmonics torque.

UNIT - VI

CHOPPER CONTROLLED DC MOTOR DRIVES: Principles of operation of the chopper, four quadrant chopper circuit, chopper for inversion, chopper with other power devices, model of the chopper, input to the chopper steady state analysis of chopper controlled DC motor drives, rating of the devices, pulsating torque.

UNIT - VII

CLOSED LOOP OPERATION OF DC MOTOR DRIVES: Speed controlled drive system, current control loop, pulse width modulated current controller, hysteresis current controller, modeling of current controller, design of current controller.

UNIT - VIII

SIMULATION OF DC MOTOR DRIVES: Dynamic simulations of the speed controlled DC motor drives, speed feedback speed controller, command current generator, current controller.

TEXT BOOKS:

1. Shepherd, Hulley, Liang (2000), *Power Electronic and motor control*, 2nd Edition, Cambridge University Press, UK.
2. R. Krishnan (2005), *Electric Motor drives modeling, Analysis and control*, 1st Edition, Prentice Hall of India, New Delhi, India.

REFERENCE BOOKS:

1. M. H. Rashid (1995), *Power Electronic circuits, Drives and Applications*, 1st Edition, Prentice Hall of India, New Delhi, India.
2. G. K. Dubey (1995), *Fundamentals of Electric Drives*, 1st Edition, Narosa Publications, New Delhi, India.
3. S. B. Dewan, A. Straughen (1984), *Power Semiconductor drives*, 1st Edition, Wiley & sons, USA.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I SEMESTER

ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

(Professional Elective - I)

Course Code: B3351

L	P	C
3	0	3

UNIT - I

INTEL 8086: Architecture, its register organization, pin diagram, minimum and maximum mode system and timings, machine language instruction formats, addressing modes, instruction set, assembler directives.

UNIT - II

HARDWARE DESCRIPTION: Pin diagram, minimum and maximum mode and bus timings, ready and wait states and 8086 based micro-computing system.

UNIT - III

ALP AND SPECIAL FEATURES: ALP, programming with an assembler, stack structure, interrupts, service subroutines and interrupt programming and macros.

UNIT - IV

ADVANCED PROCESSORS: Architectural features of 80386, 486 and Pentium processors their memory management, introduction to Pentium pro processors their features, RISC vs. CISC processors.

UNIT - V

BASIC PERIPHERALS AND THEIR INTERFACING: Memory interfacing (DRAM), PPI-modes of operation of 8255, interfacing to ADC and DAC.

UNIT - VI

SPECIAL PURPOSE OF PROGRAMMABLE PERIPHERAL DEVICES AND THEIR INTERFACING: Programmable timer-8253, PIC 8259A, display controller, programmable communication interface 8251- USART and their interfacing.

UNIT - VII

MICROCONTROLLERS: Introduction to Intel 8-bit and 16-bit microcontrollers, 8051 architecture, memory organization, addressing modes.

UNIT - VIII

HARDWARE DESCRIPTION OF 8051: Instruction formats, instruction sets, interrupt structure and interrupt priorities, port structures and operation linear counter functions, different modes of operation and programming examples.

TEXT BOOKS:

1. Barry B. Brey (2009), *The Intel Microprocessors, Architecture, Programming and interfacing*, 8th edition, Prentice Hall Higher education, USA.
2. Muhammad Ali Mazidi, Janice Gillis pie, Mazidi (2007), *The 8051 Microcontroller and Embedded systems*, Pearson Education, New Delhi, India.

REFERENCE BOOKS:

1. Kenrith J. Ayala (1995), *8086 Microprocessor*, 3rd Edition, Thomson publishers, New Delhi.
2. Kenrith J. Ayala 1993(), *Microcontrollers*, 3rd Edition, Thomson publishers, New Delhi
3. Douglas V. Hall(1991), *Microprocessor and Interfacing Programming and Hardware*, Greg Community College Division Publisher, India.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I SEMESTER

POWER SEMI CONDUCTOR DEVICES
(Professional Elective - I)

Course Code: B3352

L P C
3 0 3

UNIT - I

OVERVIEW OF POWER SWITCHING DEVICES: Introduction to power switching devices, classification of devices, controlled and un-controlled devices, I-V characteristics of ideal and real switching devices.

UNIT - II

POWER DIODES: Device structure and I-V characteristics, SPICE model, ratings and specifications, switching characteristics, reverse recovery, classification of various diodes: Schotky diode, line frequency diodes, fast recovery diodes.

UNIT - III

POWER TRANSISTORS: Device structure and I-V characteristics, SPICE model, ratings and specifications, switching characteristics, on to off and off to on state transitions, on/off transition loss analysis, driver circuit.

UNIT - IV

POWER MOSFETS: Device structure and I-V characteristics, ratings and specifications, switching characteristics, on to off and off to on state transitions, on/off transition loss analysis, driver circuit.

UNIT - V

IGBT: Device structure and I-V characteristics, ratings and specifications, switching characteristics, on to off and off to on state transitions, on/off transition loss analysis. Comparison of all the above devices with reference to power handling capability, frequency of operation, driver circuit, emerging power switching devices.

UNIT - VI

THYRISTOR: Device structure and I-V characteristics, ratings and specifications, switching characteristics, SPICE model, device protection against over voltage/currents, DI/DT and DV/DT , safe operating area, design of snubbers for power devices.

UNIT - VII

THERMAL MANAGEMENT: Conduction and transition losses computation, thermal model of the device, steady state temperature rise, electrical equivalent circuit of thermal model, sizing of the heat sink.

UNIT - VIII

PASSIVE COMPONENTS: Magnetic circuit, review of design of line frequency inductors and transformers, design of high frequency inductors and transformers.

TEXT BOOKS:

1. B. W. Williams (1992), *Power Electronics: Devices Drivers and Applications, and Passive components*, 2nd Edition, Tata Mac Graw Hill, New Delhi.

REFERENCE BOOKS:

1. M. H. Rashid (2003), *Power Electronics Circuits, Devices and Applications*, Prentice Hall of India, New Delhi.
2. Mohan, Undeland (1989), *Power Electronics –Converters, Applications and Design*, John Wiley & Sons, India.
3. L. Umanand (2009), *Power Electronics: Essentials and Applications*, 1st edition, Wiley India publishers, India.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I SEMESTER

DISTRIBUTION AUTOMATION
(Professional Elective - I)

Course Code: B3353

L P C
3 0 3

UNIT - I

DISTRIBUTION AUTOMATION AND THE UTILITY SYSTEM: Introduction to distribution automation (DA), control system interfaces, control and data requirements, centralized vs. decentralized control, DA system (DAS), DA hardware, DAS software.

UNIT - II

DISTRIBUTION AUTOMATION FUNCTIONS: DA capabilities, automation system computer facilities, management processes, information management, system reliability management, system efficiency management, voltage management, load management.

UNIT - III

COMMUNICATION SYSTEMS FOR DA: DA communication requirements, communication reliability, cost effectiveness, data rate requirements, two way capability, ability to communicate during outages and faults, ease of operation and maintenance, conforming to the architecture of data flow.

UNIT - IV

COMMUNICATION SYSTEMS USED IN DA: Distribution line carrier (power line carrier), ripple control, zero crossing technique, telephone, cable TV, radio, AM broadcast, FM SCA, VHF radio, UHF radio, microwave satellite. Fiber optics, hybrid communication systems, communication systems used in field tests.

UNIT - V

TECHNICAL BENEFITS: DA benefit categories, capital deferred savings, operation and maintenance savings, interruption related savings, customer related savings, operational savings, improved operation, function benefits, potential benefits for functions, and function shared benefits, guidelines for formulation of estimating equations.

UNIT - VI

Parameters required, economic impact areas, resources for determining benefits impact on distribution system, integration of benefits into economic evaluation.

UNIT - VII

ECONOMIC EVALUATION METHODS: Development and evaluation of alternate plans, select study area, select study period, project load growth, develop alternatives, calculate operating and maintenance costs, evaluate alternatives.

UNIT - VIII

Economic comparison of alternate plans, classification of expenses and capital expenditures, comparison of revenue requirements of alternative plans, book life and continuing plant analysis, year by year revenue requirement analysis, short term analysis, end of study adjustment, break even analysis, sensitivity analysis computational aids.

TEXT BOOKS:

1. R. P. Gupta (2006), *Electric Power Distribution Automation*, 2nd Edition, Narosa Publication, India.
2. James A. Momoh (2004), *Electric Power Distribution, Automation, Protection, and Control*, 3rd Edition, CRC Press, India.

REFERENCE BOOKS:

1. James N. Green, Robert G. Wilson (2005), *Control and Automation of Electrical Power Distribution Systems*, 3rd edition, CRC Press, India.
2. Dr M. K. Khedkar, Dr G. M. Dhole (2004), *A Textbook of Electric Power Distribution Automation*, 2nd edition, Laxmi Publisher, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING (AUTONOMOUS)

M. Tech. PEED I SEMESTER

EVOLUTIONARY COMPUTATION (Professional Elective - II)

Course Code: B3354

L	P	C
3	0	3

UNIT - I

INTRODUCTION TO ANN: Introduction, humans and computers, organization of brain, biological neuron, artificial neuron model, Mc-Culloch Pitts model, types of activation functions, ANN architectures.

UNIT - II

ESSENTIALS OF ANN: Learning strategy, learning rules, activation dynamics, synaptic dynamics, Rosenblatt's perceptron model, perceptron learning algorithm, adaline and madaline, back propagation.

UNIT - III

ASSOCIATIVE MEMORIES: Concept of associative memory, bidirectional associative memory, BAM training algorithm, BAM energy function. Hopfield network architecture, self organizing networks, adaptive resonance theory (ART), hamming networks, MAX networks.

UNIT - IV

INTRODUCTION TO GENETIC ALGORITHM: Genetic algorithms, history, biological background, working principle, mathematical foundations.

UNIT - V

COMPUTER IMPLEMENTATION OF GENETIC ALGORITHM: Reproduction, cross over and mutation, fitness scaling, coding, discretization, applications of GA

UNIT - VI

FUZZY LOGIC SYSTEMS: Introduction to crisp and fuzzy sets, fuzzy set properties and operations, fuzzy relations, membership functions and cardinalities.

UNIT - VII

FUZZY LOGICS AND APPLICATIONS: Geometry of fuzzy sets, fuzzy theorems-fuzzy entropy theorem, subsethood theorem, measure of fuzziness, index of fuzziness, defuzzification of crisp sets, defuzzification methods.

UNIT - VIII

PARTICLE SWARM OPTIMIZATION: Concept of particle swarm optimization, PSO modeling, PSO parameter control, comparison between PSO and GA, comparison between PSO and ANN.

TEXT BOOKS:

1. Rajasekharan, Rai (2004), *Neural Networks, Fuzzy Logic and Genetic Algorithm*, Prentice Hall of India, New Delhi, India
2. S. N. Sivanandam, S. Sumathi, S. N. Deepa (2006), *Introduction to Neural Networks using MATLAB*, Tata Mcgraw Hill, New Delhi.

REFERENCE BOOKS:

1. James A. Freeman, Davis S. Kapura (2002), *Neural networks*, 2nd Edition, Pearson Education, India.
2. Simon Halkins (1998), *Neural Networks and Learning Machines*, 2nd Edition, Prentice Hall of India, New Delhi.
3. C. Eliasmith, CH. Anderson (2003), *Neural Engineering*, Prentice Hall of India, New Delhi.
4. Bark Kosko (1992), *Neural Networks and Fuzzy Logic System*, Prentice Hall of India, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED I SEMESTER

ENERGY CONVERSION SYSTEMS

(Professional Elective - II)

Course Code: B3355

L	P	C
3	0	3

UNIT - I

PHOTO VOLTAIC POWER GENERATION: Spectral distribution of energy in solar radiation, solar cell configurations, voltage developed by solar cell, photo current and load current, practical solar cell performance, commercial photovoltaic systems, test specifications for PV systems, applications of super conducting materials in electrical equipments systems.

UNIT - II

PRINCIPLES OF MHD POWER GENERATION: Ideal MHD generator performance, practical MHD generator, MHD technology.

UNIT - III

WIND ENERGY CONVERSION: Power from wind, properties of air and wind, types of wind turbines, operating characteristics.

UNIT - IV

TIDES AND TIDAL POWER STATIONS: Modes of operation, tidal project examples, turbines and generators for tidal power generation.

UNIT - V

WAVE ENERGY CONVERSION: Properties of waves and power content, vertex motion of waves, device applications. Types of ocean thermal energy conversion systems application of OTEC systems examples.

UNIT - VI

MISCELLANEOUS ENERGY CONVERSION SYSTEMS: Coal gasification and liquefaction, biomass conversion, geothermal energy, thermo electric energy conversion.

UNIT - VII

PRINCIPLES OF EMF GENERATION: Description of fuel cells, co-generation and energy storage, combined cycle cogeneration, energy storage. Global energy position and environmental effects, energy units, global energy position.

UNIT - VIII

TYPES OF FUEL CELLS: H₂O₂ fuel cells, application of fuel cells, batteries, description of batteries, battery application for large power. Environmental effects of energy conversion systems, pollution from coal and preventive measures, steam stations and pollution, pollution free energy systems.

TEXT BOOKS:

1. Rakosh das Begamudre (2000), *Energy conversion systems*, 1st edition, New age international publishers, New Delhi.

REFERENCE BOOKS:

1. Godfrey Boyle (2004), *Renewable Energy*, 2nd Edition, Oxford University Press Inc, New York.
2. John Twidell, Tony Weir (2005), *Renewable Energy Resources*, 2nd edition, Taylor and Francis group, New York, USA.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I SEMESTER

OPTIMAL CONTROL SYSTEMS
(Professional Elective - II)

Course Code: B3356

L	P	C
3	0	3

UNIT-I

Optimal control law, the principal of optimality, application of their optimality principle to decision making, an optimal control system.

UNIT-II

Recurrence relation of dynamic programming, computational procedure for solving control problem, characteristics of dynamic programming solution.

UNIT-III

Discrete linear regulator problem. Hamilton –jocobi-bellman equation. Continuous linear regulator Problems, necessary and sufficient conditions examples.

UNIT-IV

The calculus of variations & Pontrygin’s minimum principle :Fundamental concepts, functional of a single function, functional involving several independent functions, necessary conditions for optimal control, linear regulator problem.

UNIT-V

Pontrygin’s minimum principle and state inequality constrains, minimum time problems, minimum control effort problems.

UNIT-VI

Iterative numerical techniques for finding optimal controls and trajectories: Two point boundary value problems, method of steepest descent algorithm, variation of extremals, variation of extremal algorithm, gradient projection algorithm

UNIT-VII

The nature of the state estimation problem, non-statistical estimation design with full estimator dimension, non-statistical estimation with reduced estimator design.

UNIT-VIII

Description of plants noise statistics, statement of optimal estimation problem, information of the optimal estimation problem as an optimal regulator problem, solution to the regulator problem in feedback form, explicit solution of the optimal estimation problem.

TEXT BOOKS:

1. Jasbir S. Arora, Introduction to optimum design, Elsevier, 2005.

REFERENCE BOOKS:

1. A Ravindran, K.M. Ragsdell, and G.V. Reklaitis, Engineering optimization: Methods and applications, Wiley India Edition.
2. Donald E.Kirk, Optimal Control Theory an Introduction, Prentice -Hall Network series –First edition, 1970.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEED I SEMESTER

POWER CONVERTERS LAB

Course Code: **B3304**

L P C
0 3 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 fully controlled converter(Bridge) with inductive load
10. Single phase half controlled converter(Bridge) with inductive load

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEEDII SEMESTER

POWER ELECTRONIC CONVERTERS-II

Course Code: B3306

L P C
3 0 3

UNIT - I

MODERN POWER SEMICONDUCTOR DEVICES: Modern power semiconductor devices, MOS turn off thyristor (MTO), Emitter turn off thyristor (ETO), Integrated gate commutated thyristor (IGCTs), MOS controlled thyristors (MCTs), Static induction thyristors (SITHs), Power integrated circuits (PICs), symbol, structure and equivalent circuit, comparison of their features.

UNIT - II

RESONANT PULSE INVERTERS: Resonant pulse inverters, series resonant inverters, series resonant inverters with unidirectional switches, series resonant inverters with bidirectional switches, analysis of half bridge resonant inverter, evaluation of currents and voltages of a simple resonant inverter, analysis of half bridge and full bridge resonant inverter with bidirectional switches.

UNIT - III

FREQUENCY RESPONSE: Series resonant inverters, for series loaded inverter, for parallel loaded inverter, for series and parallel loaded inverters, parallel resonant inverters, voltage control of resonant inverters, class E resonant inverter, class E resonant rectifier, evaluation of values of C 's and L 's for class E inverter and class E rectifier, numerical problems.

UNIT - IV

RESONANT CONVERTERS: Resonant converters, zero current switching resonant converters, L type ZCS resonant converter, M type ZCS resonant converter, zero voltage switching resonant converters, comparison between ZCS and ZVS resonant converters, two quadrant ZVS resonant converters, resonant DC link inverters, evaluation of L and C for a zero current switching inverter, numerical problems.

UNIT - V

MULTILEVEL INVERTERS: Multilevel concept, classification of multilevel inverters, diode clamped multilevel inverter, principle of operation, main features, improved diode clamped inverter, principle of operation, flying capacitors multilevel inverter principle of operation, main features, cascaded multilevel inverter principle of operation, main features.

UNIT - VI

MULTILEVEL INVERTER APPLICATIONS: Reactive power compensation, back to back intertie system, adjustable drives, switching device currents, DC link capacitor voltage balancing, features of multilevel inverters, comparisons of multilevel converters.

UNIT - VII

D.C AND A.C POWER SUPPLIES: DC power supplies, classification, switched mode DC power supplies, fly back converter, forward converter, push pull converter, half bridge converter, full bridge converter, resonant DC power supplies, bidirectional power supplies, applications.

UNIT - VIII

AC POWER SUPPLIES: Classification, switched mode AC power supplies, resonant AC power supplies, bidirectional AC power supplies, multistage conversions, control circuits, applications. Introduction to power line disturbances, power conditioners, uninterruptible power supplies, applications.

TEXT BOOKS:

1. Mohammed H. Rashid (2004), *Power Electronics*, 3rd edition, Pearson Education, India.
2. Ned Mohan, Tore M. Undeland, William P. Robbins (2002), *Power Electronics*, 3rd edition, John Wiley & Sons, New York.

REFERENCE BOOKS:

1. Robert W. Erickson, Dragan Maksimovic (2000), *Fundamentals of Power Electronics*, 2nd edition, Kluwer Academic Publisher, USA.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEEDII SEMESTER

POWER ELECTRONIC CONTROL OF AC DRIVES

Course Code: B3307

L P C
3 0 3

UNIT - I

INTRODUCTION TO AC DRIVES: Introduction to motor drives, torque production, equivalent circuit analysis, speedtorque characteristics with variable voltage operation, variable frequency operation, constant V/F operation, induction motor characteristics in constant torque and field weakening regions.

UNIT - II

CONTROL OF INDUCTION MOTOR DRIVES AT STATOR SIDE: Scalar control, voltage fed inverter control, open loopvolts/Hz control, speed control slip regulation, speed control with torque and flux control, current controlled voltagefed inverter drive, current fed inverter control, independent current and frequency control, speed and flux control incurrent fed inverter drive volts/hertz control, current fed inverter drive efficiency optimization control by flux program.

UNIT - III

CONTROL OF INDUCTION MOTOR AT ROTOR SIDE: Slip power recovery drives, tatic Kramer drive phasor diagram,torque expression, speed control of Kramer drive, static scheribus drive, modes of operation.

UNIT - IV

VECTOR CONTROL OF INDUCTION MOTOR DRIVES: Principles of vector control, vector control methods, directmethod of vector control, adaptive control principles, self tuning regulator model referencing control.

UNIT - V

CONTROL OF SYNCHRONOUS MOTOR DRIVES: Synchronous motor and its characteristics, control strategies, constanttorque angle control, unity power factor control, constant mutual flux linkage control.

UNIT - VI

CONTROLLERS: Flux weakening operation, maximum speed, direct flux weakening algorithm, constant torque modecontroller, flux weakening controller, indirect flux weakening, maximum permissible torque speed control scheme,implementation strategy, speed controller design.

UNIT - VII

VARIABLE RELUCTANCE MOTOR DRIVE: Variable reluctance motor drives, torque production in the variable reluctancemotor, drive characteristics and control principles, current control variable reluctance servo drive.

UNIT - VIII

BRUSHLESS DC MOTOR DRIVES: Three phase full wave brushless DC motor, sinusoidal type of brushless DC motor,current controlled brushless DC servo drives.

TEXT BOOKS:

1. R. Krishnan (2002), *Electric Motor Drives analysis and control*, 1st edition, Prentice Hall of India, New Delhi.
2. B. K. Bose (2001), *Modern Power Electronics and AC Drives*, 1st edition, Pearson Education, New Delhi.

REFERENCE BOOKS:

1. M. H Rashid (1995), *Power Electronics Circuits, Devices and Applications*, Prentice Hall of India, New Delhi.
2. G. K. Dubey (1995), *Fundamentals of Electric Drives*, Narosa Publications, New Delhi.
3. M. D. Murphy (1988), *Power Electronic Control of AC motors*, 1st edition, FG Turn Bull Pergman Press, India.
4. B. K. Bose (2001), *Power Electronics and AC drives*, 1st Edition, Prentice Hall Publication, New Jersey.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEEDII SEMESTER

FLEXIBLE AC TRANSMISSION SYSTEMS

Course Code: B3308

L P C
3 0 3

UNIT - I

FACTS CONCEPTS: Transmission interconnections power flow in an AC system, loading capability limits, dynamic stability considerations, importance of controllable parameters basic types of FACTS controllers, benefits from FACTS controllers.

UNIT - II

VOLTAGE SOURCE CONVERTERS: Single phase three phase full wave bridge converters transformer connections for 12 pulse 24 and 48 pulse operation.

UNIT - III

THREE LEVEL VOLTAGE SOURCE CONVERTERS: Pulse width modulation converter, basic concept of current source converters, comparison of current source converters with voltage source converters.

UNIT - IV

STATIC SHUNT COMPENSATION: Objectives of shunt compensation, mid point voltage regulation voltage instability prevention, improvement of transient stability.

UNIT - V

POWER OSCILLATION DAMPING: Methods of controllable var generation, variable impedance type static var generators, switching converter type var generators, hybrid var generators.

UNIT - VI

SVC: The regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping operating point control and summary of compensator control.

UNIT - VII

STATCOM: The regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping operating point control and summary of compensator control.

UNIT - VIII

STATIC SERIES COMPENSATORS: Concept of series capacitive compensation, improvement of transient stability, power oscillation damping, functional requirements. GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC) control schemes for GSC TSSC and TCSC.

TEXT BOOKS:

1. N. G. Hingorani, L. Gyugi (2000), *Understanding FACTS Devices*, 1st edition, Wiley -IEEE Press, USA.

REFERENCE BOOKS:

1. Xiao ping Zhang (2000), *Flexible Ac Transmission Systems*, 1st edition, The Institution of Engineering and Technology (IET), UK.
2. K. R. Padiyar (2007), *FACTS: Controllers in Power Transmission and Distribution*, 1st edition, New Age International, India.

VARDHAMAN COLLEGE OF ENGINEERING (AUTONOMOUS)

M. Tech. PEEDII SEMESTER

RELIABILITY ENGINEERING (Professional Elective - III)

Course Code: B3357

L P C
3 0 3

UNIT - I

ELEMENTS OF PROBABILITY THEORY PROBABILITY DISTRIBUTIONS: Random variables, density and distribution functions, mathematical expectation, binomial distribution, poisson distribution, normal distribution, exponential distribution, weibull distribution.

UNIT - II

DEFINITION OF RELIABILITY: Significance of the terms appearing in the definition. Component reliability, hazard rate, derivation of the reliability functions in terms of the hazard rate, hazard models.

UNIT - III

FAILURES: Causes of failures, types of failures (early failures, chance failures and wear-out failures). Modes of failure, bath tub curve, effect of preventive maintenance, measures of reliability, mean time to failure and mean time between failures.

UNIT - IV

RELIABILITY LOGIC DIAGRAMS (RELIABILITY BLOCK DIAGRAMS) CLASSIFICATION OF ENGINEERING SYSTEMS: Series, parallel, series parallel, parallel series and non series-parallel configurations. Expressions for the reliability of the basic configurations.

UNIT - V

RELIABILITY EVALUATION OF NON SERIES PARALLEL CONFIGURATIONS: Minimal tie set, minimal cut set and decomposition methods. Deduction of the minimal cut sets from the minimal path sets.

UNIT - VI

DISCRETE MARKOV CHAINS: General modeling concepts, stochastic transitional probability matrix, time dependent probability evaluation and limiting state probability evaluation, absorbing states.

UNIT - VII

CONTINUOUS MARKOV PROCESSES: Modeling concepts, state space diagrams, stochastic transitional probability matrix, evaluating limiting state probabilities. Reliability evaluation of repairable systems.

UNIT - VIII

SERIES SYSTEMS AND PARALLEL SYSTEMS: Series systems and parallel systems with two and more than two components, network reduction techniques. Minimal cut set/failure mode approach.

TEXT BOOKS:

1. Roy Billinton, Ronald N. Allan (1992), *Reliability Evaluation of Engineering Systems*, 2nd Edition, Plenum Press, New York.
2. Hoang Pham (2003), *Handbook of reliability engineering*, 1st Edition, Springer Verlag, New York.

REFERENCE BOOKS:

1. Roy Billinton, Wenyan Li (1994), *Reliability assessment of electric power systems using Monte Carlo methods*, 1st Edition, Plenum Publishing Corporation, USA.
2. Ajit Kumar Verma, Srividya Ajit, Durga Rao Karanki (2010), *Reliability and Safety Engineering*, 1st Edition, Springer Publication, New York

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEEDII SEMESTER

POWER QUALITY

(Professional Elective - III)

Course Code: B3358

L P C
3 0 3

UNIT - I

INTRODUCTION: Introduction of the power quality (PQ) problem, terms used in PQ, sags, swells, surges, harmonics, interruptions, assessing PQ, remedies, customer side of meter, utility side of the meter.

UNIT - II

POWER QUALITY DATA: Data collection, data analysis, database structure, creating PQ databases, processing PQ data.

UNIT - III

VOLTAGE SAG ANALYSIS: Voltage sag characteristics, methodology for computation of voltage sag magnitude and occurrence, accuracy of sag analysis, duration and frequency of sags, effect of transformer connections, effect of prefault voltage, simple examples, voltage dip problems, fast assessment methods for voltage sags in distribution systems.

UNIT - IV

PQ CONSIDERATIONS IN INDUSTRIAL POWER SYSTEMS: Adjustable speed drive (ASD) systems and applications, sources of power system harmonics, mitigation of harmonics. Characterization of voltage sags experienced by three phase.

UNIT - V

ASD SYSTEMS: Types of sags and phase angle jumps, effects of momentary voltage dips on the operation of induction and synchronous motors, voltage sag coordination for reliable plant operation.

UNIT - VI

EFFECTS OF HARMONICS ON POWER QUALITY: Harmonic analysis of industrial customers, technical barriers in ASDs. Methods of evaluation of harmonic levels in industrial distribution systems, harmonic effects on transformers, impact of distribution system capacitor banks on PQ. Guidelines for limiting voltage harmonics.

UNIT - VII

POWER QUALITY AND FACTORY AUTOMATION: General plant description, monitoring strategy, equipment selection and testing, design philosophy of filters to reduce harmonic distortion, power conditioners, voltage flicker measurement and analysis system.

UNIT - VIII

POWER QUALITY STANDARDS AND GUIDELINES: Industry standards and general guidelines. Global quality standards: ISO 9000, framework for quality, rewards of quality with ISO 9000.

TEXT BOOKS:

1. C. Sankaran (2001), *Power Quality*, 1st edition, CRC Press, USA.
2. Surajit Chattopadhyay, Madhuchhanda Mitra, Samarjit Sengupta (2011), *Electrical Power Quality*, 1st Edition, Springer Verlag, New York.

REFERENCE BOOKS:

1. Angelo Baggingi (2008), *Hand Book of Power Quality*, 1st Edition, John Wiley & sons, New York.
2. R. Sastry Vedam, Mulukutla S. Sarma (2008), *Power Quality: VAR Compensation in Power Systems*, 1st Edition, CRC Press, USA.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEEDII SEMESTER

MODERN CONTROL ENGINEERING

(Professional Elective - III)

Course Code: B3359

L	P	C
3	0	3

UNIT - I

MATHEMATICAL PRELIMINARIES: Fields, vectors and vector spaces, linear combinations and bases, linear transformations and matrices, scalar product and norms, Eigen values, Eigen vectors and a canonical form representation of linear operators.

UNIT - II

SAMPLING AND RECONSTRUCTION: Sample and hold operations, sampling theorem, reconstruction of original sampled signal to continuous time signal. The z -transforms, properties of z -transforms and inverse z -transforms, modified z -transforms. Introduction, linear difference equations, pulse response, z -transforms, theorems of z -transforms, the inverse z -transforms. Pulse transforms function, block diagram analysis of sampled data systems.

UNIT - III

STATE SPACE ANALYSIS: The concept of state, obtaining state equations for continuous and discrete time dynamic systems, time invariance and linearity, non uniqueness of state model, state diagrams for continuous and discrete time state models. Discretization of continuous time state space equations.

UNIT - IV

EXISTENCE AND UNIQUENESS OF SOLUTIONS TO CONTINUOUS AND DISCRETE TIME STATE EQUATIONS: Solutions of linear time invariant continuous and discrete time state equations, state transition matrix and its properties.

UNIT - V

CONTROLLABILITY AND OBSERVABILITY: General concept of controllability, general concept of observability, controllability tests for continuous and discrete time invariant systems, observability tests for continuous and discrete time invariant systems, controllability and observability of state model in Jordan canonical form, controllability and observability canonical forms of state model. Controllability and observability conditions for pulse transfer function.

UNIT - VI

STABILITY ANALYSIS: Stability in the sense of Lyapunov, Lyapunov's stability and Lyapunov's instability theorems, stability analysis of the linear continuous time invariant systems by Lyapunov second method, generation of Lyapunov functions, variable gradient method, Krasovskii's method.

UNIT - VII

STABILITY ANALYSIS OF CLOSED LOOP SYSTEMS: For z -plane, Jury stability test, stability analysis by use of the bilinear transformation and Routh stability criterion.

UNIT - VIII

STATE FEEDBACK CONTROLLERS AND OBSERVERS: State feedback controller design through pole assignment for continuous and discrete time systems. State observers, full order and reduced order for continuous and discrete time systems. Design digital control through deadbeat response method.

TEXT BOOKS:

1. M. Gopal (1993), *Modern Control System Theory*, 2nd Edition, New Age International, New Delhi.

REFERENCE BOOKS:

1. Ogata. K (1994), *Modern Control Engineering*, 3rd Edition, Prentice Hall of India, New Delhi, India.
2. Ogata. K (1995), *Discrete time Control Systems*, 2nd Edition, Prentice Hall of India, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEEDII SEMESTER

PROGRAMMABLE LOGIC CONTROLLERS AND APPLICATIONS

(Professional Elective -IV)

Course Code: B3360

L	P	C
3	0	3

UNIT - I

PLC BASICS: PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming formats, construction of plc ladder diagrams, devices connected to I/O modules.

UNIT - II

PLC PROGRAMMING: Input instructions, outputs, operational procedures, programming examples using contacts and coils, drill press operation.

UNIT - III

DIGITAL LOGIC GATES: Programming in the boolean algebra system, conversion examples.

LADDER DIAGRAMS FOR PROCESS CONTROL: Ladder diagrams and sequence listings, ladder diagram constructions and flow charts for spray process system.

UNIT - IV

PLC REGISTERS: Characteristics of registers module addressing, holding registers, input registers, output registers.

UNIT - V

PLC FUNCTIONS: Timer functions and industrial applications, counters, counter function industrial applications, arithmetic functions, number comparison.

UNIT - VI

DATA HANDLING FUNCTIONS: SKIP, master control relay, jump, move, FIFO, FAL, ONS, CLR and SWEEP functions and their applications.

UNIT - VII

BIT PATTERN AND CHANGING A BIT SHIFT REGISTER: Sequence functions and applications, controlling of two axis and three axis robots with PLC, matrix functions.

UNIT - VIII

ANALOG PLC OPERATION: Analog modules and systems, analog signal processing, multi bit data processing, analog output application examples, PID principles, position indicator with PID control, PID modules, PID tuning, PID functions.

TEXT BOOKS:

1. Alan J. Crispin (1996), *Programmable Logic Control and their Engineering Applications*, 2nd Edition, Mc GrawHills Companies, New Delhi.

REFERENCE BOOKS:

1. John W. Webb, Ronald A. Reiss (2005), *Programmable logic controllers Principle and applications*, 5th edition, Prentice Hall of India, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEEDII SEMESTER

REACTIVE POWER COMPENSATION AND MANAGEMENT

(Professional Elective -IV)

Course Code: B3361

L	P	C
3	0	3

UNIT - I

LOAD COMPENSATION: Objectives and specifications, reactive power characteristics, inductive and capacitive approximate biasing, load compensator as a voltage regulator, phase balancing and power factor correction of unsymmetrical loads examples.

UNIT - II

STEADY STATE REACTIVE POWER COMPENSATION IN TRANSMISSION SYSTEM: Uncompensated line, types of compensation, passive shunt and series and dynamic shunt compensation, examples.

UNIT - III

TRANSIENT STATE REACTIVE POWER COMPENSATION IN TRANSMISSION SYSTEMS: Characteristic time periods, passive shunt compensation, static compensations, series capacitor compensation, compensation using synchronous condensers, examples.

UNIT - IV

REACTIVE POWER COORDINATION: Objective mathematical modeling, operation planning, transmission benefits, basic concepts of quality of power supply, disturbances, steady state variations, effects of under voltages, frequency, harmonics, radio frequency and electromagnetic interferences.

UNIT - V

DEMAND SIDE MANAGEMENT: Load patterns, basic methods load shaping, power tariffs, KVAR based tariffs, penalties for voltage flickers and harmonic voltage levels.

UNIT - VI

DISTRIBUTION SIDE REACTIVE POWER MANAGEMENT: System losses, loss reduction methods, examples, reactive power planning, objectives, economics planning capacitor placement, retrofitting of capacitor banks.

UNIT - VII

USER SIDE REACTIVE POWER MANAGEMENT: KVAR requirements for domestic appliances, purpose of using capacitors, selection of capacitors, deciding factors, types of available capacitor, characteristics and limitations.

UNIT - VIII

REACTIVE POWER MANAGEMENT IN ELECTRIC TRACTION SYSTEMS AND ARC FURNACES: Typical layout of traction systems, reactive power control requirements, distribution transformers, electric arc furnaces, basic operations, furnaces transformer, filter requirements, remedial measures, power factor of an arc furnace.

TEXT BOOKS:

1. T. J. E. Miller (1982), *Reactive power control in Electric power systems*, 1st Edition, John Wiley & sons, New Delhi, India.

REFERENCE BOOKS:

1. D. M. Tagare (2004), *Reactive power Management*, Tata McGraw Hill, New Delhi

VARDHAMAN COLLEGE OF ENGINEERING (AUTONOMOUS)

M. Tech. PEEDII SEMESTER

SPECIAL ELECTRICAL MACHINES (Professional Elective -IV)

Course Code: B3362

L P C
3 0 3

UNIT-I

SPECIAL TYPES OF D.C MACHINES-I

Series booster-Shunt booster-Non-reversible boost-Reversible booster

SPECIAL TYPES OF DC MACHINES –II

Armature excited machines—Rosenberg generator-The Amplidyne and Metadyne - Rototrol and Regulex-third brush generator-three-wire generator-dynamometer.

UNIT–II

STEPPER MOTORS

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

UNIT-III

VARIABLE RELUCTANCE STEPPING MOTORS-I

Variable reluctance (VR) Stepping motors, single-stack VR step motors, Multiple stack VR motors-Open-loop control of 3-phase VR step motor-closed-Loop control of step motor, Discriminator (or rotor position sensor) transilator, major loop-characteristics of step motor in open-loop drive –comparison between open-loop position control with step motor and a position control servo using a conventional (dc or ac) servo motor-Suitability

UNIT-IV

APPLICATIONS OF STEPPING MOTORS

Areas of application of stepping motors-5-phase hybrid stepping motor -single phase -stepping motor, the construction, operating principle torque developed in the motor.

UNIT-V

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

UNIT–VI

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

UNIT–VII

BRUSHLESS DC MOTOR: Types of construction –principle of operation of BLDM-sensing and switching logic scheme, sensing logic controller, lockout pulses –drive and power circuits, Base drive circuits, power converter circuit - Theoretical analysis and performance prediction, modeling and magnet circuit d-q analysis of BLDM -transient analysis formulation in terms of flux linkages as state variables- Approximate solution for current and torque under steady state

Theory of BLDM as variable speed synchronous motor (assuming sinusoidal flux distribution) - Methods of reducing Torque Pulsations, 180 degrees pole arc and 120 degree current sheet.

UNIT- VIII

LINEAR INDUCTION MOTOR

Development of a double sided LIM from rotary type IM -Aschematic of LIM drive for electric traction development of one sided LIM with back iron-field analysis of a DSLIM fundamental assumptions.

TEXT BOOKS:

1. K. Venkataratnam, "Special electrical machines" -University press.
2. R. K. Rajput, "Electrical machines"-5th edition.
3. V.V. Athani, "Stepper motor : Fundamentals , Applications and Design"-New age International pub.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

M. Tech. PEEDII SEMESTER

POWER ELECTRONICS SIMULATION LAB

Course Code: **B3309**

L P C
0 3 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)

SOFTWARE ENGINEERING PRINCIPLES
(Open Elective)

Course Code: B3271

L P C
3 0 3

UNIT - I

SOFTWARE ENGINEERING AND PROCESS: The nature of software, the unique nature of web applications, software engineering, a layered technology, the essence and principles of software engineering practice, generic process model (framework), process patterns, process assessment and improvement, CMMI, software myths.

UNIT - II

PRESCRIPTIVE PROCESS MODELS: The waterfall model, incremental process models, evolutionary process models. The unified process, aspect oriented software development, agile development, agile process, extreme programming.

UNIT - III

SOFTWARE REQUIREMENTS: Introduction to functional and non-functional requirements, requirements engineering activities, eliciting requirements, requirements modeling, requirements validation, software requirements specification (SRS), requirements management, requirements modeling.

STRUCTURED VIEW: Data modeling (ERD), functional modeling (DFD) and behavioral modeling.

OBJECT ORIENTED VIEW: Use cases, CRC modeling, analysis classes, collaborations, responsibilities, object relationship model, object behavior model.

SOFTWARE PROJECT ESTIMATION: Empirical estimation models.

UNIT - IV

DESIGN CONCEPTS: Software design quality guidelines and attributes - design concepts.

SOFTWARE ARCHITECTURE: Architecture and its importance - architectural styles - data design - architectural design.

DESIGN: STRUCTURED VIEW (TRADITIONAL VIEW): Architectural mapping using data flow (call and return architecture), interface design, function based component design.

OBJECT ORIENTED VIEW: Object oriented architecture, class hierarchies, message design, class based component design.

UNIT - V

PERFORMING USER INTERFACE DESIGN: Golden rules, user interface analysis and design, interface analysis, interface design steps.

PATTERN BASED DESIGN: Design patterns, pattern based software design, architectural patterns, component level design patterns, user interface design patterns.

UNIT - VI

SOFTWARE TESTING STRATEGIES: A strategic approach to software testing, test strategies (unit testing and integration testing) for conventional and object oriented software, validation testing, system testing, the art of debugging.

UNIT - VII

TESTING CONVENTIONAL APPLICATIONS: Software testing fundamentals.

WHITE-BOX TESTING: Basis path testing, condition (predicate) testing, data flow testing, loop testing.

BLACK BOX TESTING: Equivalence partitioning, boundary value analysis, graph based testing methods.

TESTING OBJECT ORIENTED APPLICATIONS: Object oriented testing methods, testing methods applicable at class level, interclass test case design.

UNIT - VIII

UMBRELLA ACTIVITIES: Risk management, software quality assurance, software configuration management.

MEASUREMENT AND METRICS: Size oriented metrics, function oriented metrics, metrics for software quality

PRODUCT METRICS: Metrics for the requirements model, metrics for the design model, metrics for source code, metrics for testing, metrics for maintenance.

SOFTWARE REENGINEERING: A software reengineering process model, software reengineering activities.

TEXT BOOKS:

1. Roger S. Pressman (2009), *Software Engineering: A practitioner's Approach*, 7th edition, McGraw Hill, India.

2. Lan Sommerville (2004), *Software Engineering*, 7th edition, Addison Wesley, India.

REFERENCE BOOKS:

1. K.K. Agarwal , Yogesh Singh(2008), *Software Engineering*, 1st edition, New Age International Private Limited, New Delhi, India.
2. James F. Peters, Witold Pedrycz (2000), *Software Engineering: An Engineering Approach*, John Wiley & Sons.
3. Gary B. Shelly, Thomas J. Cashman, Harry J. Rosenblatt (2007), *Systems Analysis and Design*, 7th edition, Cengage Learning, India..
4. Waman S. Jawadekar (2008), *Software Engineering: Principles and practice*, Tata McGraw Hill Publishing Company Limited, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

HUMAN COMPUTER INTERACTION
(Open Elective)

Course Code: B3272

L	P	C
3	0	3

UNIT I

INTRODUCTION: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design,

UNIT II

THE GRAPHICAL USER INTERFACE: popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT III

DESIGN PROCESS: Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

UNIT IV

SCREEN DESIGNING: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT V

WINDOWS: New and Navigation schemes selection of window, selection of devices based and screen based controls.

UNIT VI

COMPONENTS : text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT VII

SOFTWARE TOOLS : Specification methods, interface – Building Tools.

UNIT VIII

INTERACTION DEVICES: Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

TEXT BOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia.

REFERENCE BOOKS:

1. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech.
3. User Interface Design, Soren Lauesen, Pearson Education.
4. Human –Computer Interaction, D.R.Olsen, Cengage Learning.
5. Human –Computer Interaction, Smith - Atakan, Cengage Learning.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

COMPUTER GRAPHICS CONCEPTS
(Open Elective)

Course Code: B3273

L P C
3 0 3

UNIT - I

INTRODUCTION: Application areas of computer graphics, overview of graphics systems, video-display devices and raster-scan systems, random scan systems, graphics monitors, work stations and input devices, graphics standards.

UNIT - II

OUTPUT PRIMITIVES: Points and lines, line drawing algorithms, midpoint circle and ellipse algorithms. Filled area primitives - scan line polygon fill algorithm, boundary fill and flood fill algorithms.

UNIT - III

2D - GEOMETRICAL TRANSFORMS: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms transformations between coordinate systems.

UNIT - IV

2D - VIEWING: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm.

UNIT - V

3D - GEOMETRIC TRANSFORMATIONS: Translation, rotation, scaling, reflection and shear transformations, composite transformations.

3D - VIEWING: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT - VI

3D - OBJECT REPRESENTATION: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces.

UNIT - VII

VISIBLE SURFACE DETECTION METHODS: classifications, back face detection, depth buffer, scan line and depth sorting.

UNIT - VIII

COMPUTER ANIMATION: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.

TEXT BOOKS:

1. Donald Hearn, M. Pauline Baker (2011), *Computer Graphics with Open GL*, 3rd edition, Pearson Education, India.

REFERENCE BOOKS:

1. David F. Rogers (1998), *Procedural elements for Computer Graphics*, 2nd edition, Tata Mc Graw Hill, New Delhi, India.
2. Steven Harrington (1987), *Computer Graphics*, 2nd edition, Schaum's outlines, Tata Mc Graw Hill Edition, USA.
3. Zhigand xiang, Roy Plastock (2000), *Computer Graphics*, 2nd edition, Tata Mc Graw Hill, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

FUNDAMENTALS OF SOFTWARE TESTING AND QUALITY ASSURANCE
(Open Elective)

Course Code: B3274

L	P	C
3	0	3

UNIT - I

INTRODUCTION AND THE TAXONOMY OF BUGS: Purpose of testing, some dichotomies, a model for testing, the consequences of bugs, taxonomy for bugs, some bug statistics.

UNIT - II

FLOW GRAPHS AND PATH TESTING: Path testing basics, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, implement and application of path testing.

UNIT - III

TRANSACTION FLOW TESTING AND DATA FLOW TESTING: Transaction flows, transaction flow testing techniques, data flow testing basics, data flow testing strategies, application, tools and effectiveness.

UNIT - IV

DOMAIN TESTING: Domains and paths, nice and ugly domains, domain testing, domains and interfaces testing, domains and testability.

UNIT - V

PATHS, PATH PRODUCTS AND REGULAR EXPRESSIONS: Path products and path expressions, a reduction procedure, applications, regular expressions and flow anomaly detection.

UNIT - VI

LOGIC BASED TESTING: Motivational overview, decision tables, path expressions again, KV charts, specifications.

STATES, STATE GRAPHS AND TRANSITION TESTING: State graphs, good state graphs and bad, state testing, testability tips.

UNIT - VII

GRAPH MATRICES AND APPLICATIONS: Motivational overview, the matrix of a graph, relations, the powers of a matrix, node reduction algorithm, building tools.

UNIT - VIII

AN OVERVIEW OF SOFTWARE TESTING TOOLS: Overview of win runner and QTP testing tools for functional / regression testing, testing an application using win runner and QTP, synchronization of test cases, data driven testing, testing a web application.

TEXT BOOKS:

1. Boris Beizer (2004), *Software Testing Techniques*, 2nd edition, Dreamtech Press, New Delhi, India.
2. Dr. K. V. K. Prasad (2005), *Software Testing Tools*, Dreamtech Press, India.

REFERENCE BOOKS:

1. William E. Perry (2006), *Effective methods of Software Testing*, 3rd edition, John Wiley Edition, USA.
2. Meyers (2004), *Art of Software Testing*, 2nd edition, John Wiley, New Jersey, USA.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

SYSTEM ON CHIP ARCHITECTURE
(Open Elective)

Course Code: B3676

L	P	C
3	0	3

UNIT - I

INTRODUCTION TO PROCESSOR DESIGN: Abstraction in Hardware Design, MUO a Simple processor, Processor Design Trade Off, Design For Low Power Consumption.

UNIT - II

ARM PROCESSOR AS SYSTEM-ON-CHIP: Acron RISC Machine-Architecture Inherence-Arm Programming Model-ARM Development Tools-3 and 5 Stage Pipeline ARM Organization-ARM Instruction Execution and Implementation-ARM Co-Processor Interface.

UNIT - III

ARM ASSEMBLY LANGUAGE PROGRAMMING: ARM Instruction Types, Data Transfer, Data processing and Control Flow Instructions, ARM Instruction Set, Co-Processor Instructions.

UNIT - IV

ARCHITECTURE SUPPORT FOR HIGH LEVEL LANGUAGE: Data Types, Abstraction in Software Design, Expressions, Loops, Functions and Procedures, Conditional Statements, Use of Memory.

UNIT - V

MEMORY HIERARCHY: Memory Size and Speed On-Chip, Memory-Caches, Cache Design, An example Memory Management.

UNIT - VI

ARCHITECTURAL SUPPORT FOR SYSTEM DEVELOPMENT: Advanced Microcontroller Bus Architecture (AMBA), ARM Memory Interface, ARM Reference Peripheral Specification, Hardware System Prototyping Tools, Armulator, Debug Architecture.

UNIT - VII

ARCHITECTURAL SUPPORT FOR OPERATING SYSTEMS: An Introduction to Operating Systems, ARM System Control Co Processor-CP15 Protection Unit Registers-ARM Protection Unit-CP15MMU Registers-ARM MMU Architecture-Synchronization-Context Switching Input and Output.

UNIT - VIII

ARM CPU CORES: The ARM710T, ARM720T and ARM730T, the ARM810, the Strong ARM SA-110.

TEXT BOOKS:

1. Steve Furber (2000), *ARM System on Chip Architecture*, 2nd edition, Addison Wesley Professional, England
2. Ricardo Reis (2004), *Design of System on a Chip: Devices and Components*, 1st edition, Springer, Netherlands.

REFERENCE BOOKS:

1. Jason Andrews (2004), *Co-Verification of Hardware and Software for ARM System on Chip Design Embedded Technology*, Newnes Publications, USA.
2. Prakash Rashinkar, Peter Paterson, Leena Sing L (2001), *System on Chip Verification-Methodologies and Techniques*, Kluwer Academic Publishers, USA.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

CRYPTOGRAPHY AND COMPUTER SECURITY
(Open Elective)

Course Code: B3677

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3 0 3

UNIT – I

INTRODUCTION SECURITY ATTACKS: Interruption, interception, modification and fabrication.

SECURITY SERVICES: Confidentiality, authentication, integrity, non repudiation, access control and availability.

SECURITY MECHANISMS: A model for internetwork security, internet standards and RFCs, conventional encryption principles, ceaser cipher, hill cipher, poly and mono alphabetic cipher.

UNIT - II

ENCRYPTION PRINCIPLES: Conventional encryption algorithms: Feistel structure, DES algorithm, S: Boxes, Triple DES, advanced data encryption standard (AES), cipher block modes of operation, location of encryption devices, Key distribution Approaches.

UNIT – III

CRYPTOGRAPHY AND APPLICATIONS : Public key cryptography principles, public key cryptography algorithms, digital signatures, RSA, elliptic algorithms, digital certificates, certificate authority and key management, Kerberos, X.509, directory authentication service. Message authentication, secure hash functions and HMAC.

UNIT – IV

ELECTRONIC MAIL SECURITY: Email privacy, PGP operations, radix: 64 conversions, key management for PGP, PGP trust model, multipurpose internet mail extension (MIME), secure/MIME(S/MIME).

UNIT – V

IP SECURITY ARCHITECTURE AND SERVICES: IP security overview, IP security architecture, security association, authentication header, encapsulating security payload, combining security associations and key management, OAKLEY key determination protocol, ISAKMP.

UNIT – VI

WEB SECURITY: Web security considerations, secure socket layer (SSL) and transport layer security (TLS), secure electronic transaction (SET).

UNIT – VII

NETWORK MANAGEMENT SECURITY: Basic concepts of SNMP, SNMPv1 community facility and SNMPv3. System Security, intruders, intrusion techniques, intrusion detection, password management, bot nets.

UNIT – VIII

MALICIOUS SOFTWARE: Viruses and related threats, virus counter measures, distributed denial of service attacks.

FIREWALLS: Firewall design principles, trusted systems, common criteria for information technology security evolution.

TEXT BOOKS:

1. William Stallings (2007), *Network Security Essentials (Applications and Standards)*, 3rd Edition, Pearson Education, New Delhi, India.
2. William Stallings (1998), *Cryptography and network Security*, 3rd Edition, Prentice Hall of India, New Delhi, India.

REFERENCE BOOKS:

1. Eric Maiwald (2004), *Fundamentals of Network Security*, Dreamtech press, India.
2. Charlie Kaufman, Radia Perlman, Mike Speciner (2002), *Network Security: Private Communication in a Public World*, 2nd Edition, Pearson Education, India.
3. Robert Bragg, Mark Rhodes (2004), *Network Security: The Complete Reference*, Tata Mcgraw Hill, New Delhi.
4. Buchmann (2004), *Introduction to Cryptography*, 2nd Edition, Springer, USA.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

INTERNETWORKING AND INTERNET PROTOCOLS
(Open Elective)

Course Code: B3678

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UNIT – I

REVIEW OF NETWORKING AND DESIGN CONCEPTS: Connectivity Multiplexing, Circuit-switching vs. packet-switching, Multiple-access Routing, addressing, Congestion control, End-to-end principle, Protocols, Layering, encapsulation, and indirection, System design: Amdahl's law, Overlays, Cross-layer design.

UNIT – II

INTERNETWORKING: Heterogeneity and scale, IP approach, Address resolution, Hierarchical addressing and subnets, Fragmentation and re-assembly, Packet format design.

UNIT – III

ROUTING BASICS: Routing and forwarding tables, Routers vs. bridges, Addressing and routing scalability, Link-state vs. distance-vector routing, Source-based routing.

UNIT – IV

INTRA-DOMAIN ROUTING: RIP, EIGRP, OSPF, PNNI, IS-IS, QoS routing, Traffic engineering and routing
INTER-DOMAIN ROUTING: Autonomous systems, Policy routing, EGP, BGP, CIDR.

UNIT – V

TRANSPORT PROTOCOL DESIGN CONNECTIONLESS VS. CONNECTION: Oriented service, Connection management: establishment, termination, UDP, TCP.

UNIT – VI

CONGESTION CONTROL CONGESTION INDICATIONS/FEEDBACKS: explicit vs. implicit, Queuing disciplines: scheduling and buffer management, RED, ARED, FRED, REM, TCP congestion control variants, Reno, Vegas, TCP modeling.

UNIT – VII

MULTICAST, GROUPS, SCOPES & TREES: Multicast addresses, Group management: IGMP, Multicast routing and forwarding, MBONE, PIM, Multicast transport protocols: reliability, congestion, Application-layer multicast.

UNIT – VIII

NETWORK MANAGEMENT: Auto-configuration, SNMP, DHCP, ICMP, IP Next Generation (IPv6), Motivation, IPv6 addressing, IPv6 header format, IPv6 features: routing flexibility, multicast support.

TEXT BOOKS:

1. Douglas Comer, (2006) Internetworking with TCP/IP Vol. I: Principles, Protocols, and Architecture; 5th edition, Prentice Hall, ISBN #: 0131876716.

REFERENCES:

1. Radia Perlman, (2011) Inter connections, Bridges, Router, Switches and internetworking protocols, 2nd Edition

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

MULTIMEDIA COMMUNICATION AND NETWORKS
(Open Elective)

Course Code: B3679

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3 0 3

UNIT I

IP NETWORKS: Open Data Network Model – Narrow Waist Model of the Internet - Success and Limitations of the Internet – Suggested Improvements for IP and TCP – Significance of UDP in modern Communication – Network level Solutions – End to End Solutions - Best Effort service model – Scheduling and dropping policies for Best Effort Service model.

UNIT II

ADVANCED ROUTING: Intra AS routing – Inter AS routing – Router Architecture – Switch Fabric – Active Queue Management – Head of Line blocking – Transition from IPv4 to IPv6.

UNIT III

MULTICASTING: Abstraction of Multicast groups, Group management, IGMP, Group Shared Multicast Tree, Source based Multicast Tree, Multicast routing in Internet, DVMRP and MOSPF, PIM, Sparse mode and Dense mode.

UNIT IV

GUARANTEED SERVICE MODEL: Best Effort service model – Scheduling and Dropping policies – Network Performance Parameters – Quality of Service and metrics – WFQ and its variants – Random Early Detection.

UNIT V

QoS AWARE ROUTING: Admission Control, Resource Reservation, RSVP, Traffic Shaping Algorithms, Caching, Laissez Faire Approach, Possible Architectures, An Overview of QoS Architectures.

UNIT VI

MULTIMEDIA COMMUNICATION: Stream characteristics for Continuous media, Temporal Relationship, Object Stream Interactions, Media Levity, Media Synchronization – Models for Temporal Specifications.

UNIT-VII

STREAMING OF AUDIO AND VIDEO: JITTER – Fixed playout and Adaptive playout, Recovering from packet loss, RTSP, Multimedia Communication Standards, RTP/RTCP – SIP and H.263.

UNIT VIII

WIRELESS MULTIMEDIA COMMUNICATION: End to End QoS provisioning in Wireless Multimedia Networks – Adaptive Framework – MAC layer QoS enhancements in Wireless Networks – A.

HYBRID MAC PROTOCOL FOR MULTIMEDIA TRAFFIC: Call Admission Control in Wireless Multimedia Networks – A Global QoS Management for Wireless Networks

TEXT BOOKS:

1. Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kaufman Publishers, 2002
2. Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education, 2004.
3. William Stallings, 'High Speed Networks: Performance and Quality of Service', 2nd Edition, Pearson Education, 2002.

REFERENCES:

1. Kurose and Ross, 'Computer Networks : A top down Approach', Pearson Education, 2002
2. Nalin K Sharda, 'Multimedia Information Networking', Prentice Hall of India, 1999
3. Aura Ganz, Zvi Ganz and Kittu Wongthawaravat, 'Multimedia Wireless Networks: Technologies, Standards and QoS', Prentice Hall, 2003.
4. Ellen Kayata Wesel, 'Wireless Multimedia Communications: Networking Video, Voice and Data', Addison Wesley, 1998.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS
(Open Elective)

Course Code: B3476

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UNIT - I

INTRODUCTION: Evolution of telecommunications, simple telephone communication, basics of switching system, manual switching system, major telecommunication networks.

CROSSBAR SWITCHING: Principles of common control, touch tone dial telephone, principles of crossbar switching, crossbar switch configurations, cross point technology, crossbar exchange organization.

UNIT - II

ELECTRONIC SPACE DIVISION SWITCHING: Stored program control, centralized SPC, distributed SPC, software architecture, application software, enhanced services, two-stage networks, three stage networks, n-stage networks.

UNIT - III

TIME DIVISION SWITCHING: Basic time division space switching, basic time division time switching, time multiplexed space switching, time multiplexed time switching, combination switching, three-stage combination switching n-stage combination switching.

UNIT - IV

TELEPHONE NETWORKS: Subscriber loop system, switching hierarchy and routing, transmission plan, transmission systems, numbering plan, charging plan, signaling techniques, in-channel signaling, common channel signaling, cellular mobile telephony.

UNIT - V

SIGNALING: Customer line signaling, audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling inter-register signaling, common-channel signaling principles, CCITT signaling system no.6, CCITT signaling system no.7, digital customer line signaling.

UNIT - VI

PACKET SWITCHING: Statistical multiplexing, local-area and wide- area networks, large-scale networks, broadband networks.

SWITCHING NETWORKS: Single-state networks, grading, link systems, grades of service of link systems, application of graph theory to link systems, use of expansion, call packing, rearrangeable networks, strict-sense non-blocking networks, sectionalized switching networks.

UNIT - VII

TELECOMMUNICATIONS TRAFFIC: The unit of traffic, congestion, traffic measurements, a mathematical model, lost-call systems, queuing systems.

UNIT - VIII

INTEGRATED SERVICES DIGITAL NETWORK: Motivation for ISDN, new services, network and protocol architecture, transmission channels, user-network interfaces, signaling, numbering and addressing, service characterization, interworking, ISDN standards, expert systems in ISDN, broadband ISDN, voice data integration.

TEXT BOOKS:

1. Thyagarajan Viswanath (2000), *Tele communication switching system and networks*, Prentice Hall of India, New Delhi, India.
2. J. E. Flood (2006), *Telecommunication switching, Traffic and Networks*, Pearson Education, India.

REFERENCE BOOKS:

1. J. Bellamy (2001), *Digital telephony*, 2nd edition, John Wiley and Sons, India.
2. AchyutS.Godbole (2004), *Data Communications & Networks*, Tata McGraw Hill, India.
3. H. Taub, D. Schilling (2003), *Principles of Communication Systems*, 2nd Edition, Tata McGraw Hill, India.
4. B.A. Forouzan (2004), *Data Communications & Networking*, 3rd Edition, Tata McGraw Hill, India.
Roger L. Freeman (2004), *Telecommunication System Engineering*, 4th edition, Wiley-Inters, India

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

MOBILE COMPUTING TECHNOLOGIES
(Open Elective)

Course Code: B3477

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3 0 3

UNIT - I

INTRODUCTION TO MOBILE COMPUTING ARCHITECTURE: Mobile computing, dialog control networks, middleware and gateways, application and services, developing mobile computing applications, security in mobile computing, architecture for mobile computing, three tier architecture, design considerations for mobile computing, mobile computing through internet, making existing applications mobile enabled.

UNIT - II

CELLULAR TECHNOLOGIES - GSM : Bluetooth, radio frequency identification, wireless broadband mobile IP, internet protocol version 6 (IPv6), Java card, GSM architecture, GSM entities, call routing in GSM, PLMN interfaces, GSM addresses and identifiers, network aspects in GSM, authentication and security.

UNIT - III

GPS, GPRS, CDMA AND 3G: Mobile computing over SMS, GPRS and packet data network, GPRS network architecture, GPRS network operations, data services in GPRS, applications for GPRS, limitations of GPRS, spread spectrum technology, Is-95, CDMA versus GSM, wireless data, third generation networks, applications on 3G.

UNIT - IV

WIRELESS APPLICATION PROTOCOL (WAP) AND WIRELESS LAN: WAP - MMS wireless LAN advantages, IEEE 802.11 standards, wireless LAN architecture, mobility in wireless LAN.

UNIT - V

INTELLIGENT AND INTERNETWORKING: Introduction, fundamentals of call processing, intelligence in the networks, SS#7 signaling, IN Conceptual Model (INCM), softswitch, programmable networks, technologies and interfaces for IN.

UNIT - VI

CLIENT PROGRAMMING, PLAM OS, SYMBIAN OS, WIN CE ARCHITECTURE: Introduction, moving beyond the desktop, a peek under the hood: hardware overview, mobile phones, PDA, design constraints in applications for handheld devices, palm OS architecture, application development, multimedia symbian OS architecture, applications for Symbian, different flavours of windows CE, windows CE architecture.

UNIT - VII

J2ME: Java in the handset, the threeprong approach to JAVA everywhere, JAVA 2 micro edition (J2ME) technology, programming for CLDC, GUI in MIDP, UI design issues, multimedia, record management system, communication in MIDP, security considerations in MIDP, optional packages.

UNIT - VIII

SECURITY ISSUES IN MOBILE COMPUTING: Introduction, information security, security techniques and algorithms, security protocols, public key infrastructure, trust, security models, security frameworks for mobile environment.

TEXT BOOKS:

1. Asoke K. Talukder, Roopa R Yavagal (2009), *Mobile computing – Technology, Applications and Service Creation*, Tata McGraw Hill, New Delhi.
2. Jochen Schiller (2008), *Mobile Communications*, 2nd Edition, Pearson Education, New Delhi.

REFERENCE BOOKS:

1. Vieri Vaughni, Alexander Damn Jaonvic (2007), *The CDMA 2000 system for Mobile Communications*, Pearson Education, New Delhi.
2. Adalestein (2008), *Fundamentals of Mobile & Pervasive Computing*, Tata McGraw Hill, New Delhi

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

HIGH PERFORMANCE NETWORKS
(Open Elective)

Course Code: B3478

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UNIT I

INTRODUCTION: A Brief Networking History, The Need for Speed and Quality of Service, Advanced TCP/IP and ATM Networks.

HIGH SPEED NETWORKS: Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL.

UNIT II

HIGH SPEED LANS: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements and Architecture of 802.11

UNIT III

CONGESTION: Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control.

UNIT IV

TRAFFIC MANAGEMENT: Congestion Control in Packet Switching, Networks – Frame Relay Congestion Control.

UNIT V

TCP CONGESTION CONTROL: TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM.

UNIT VI

ATM CONGESTION CONTROL: Traffic and Congestion control in ATM – Requirements – Attributes –90, Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

UNIT VII

INTEGRATED AND DIFFERENTIATED SERVICES: Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRfq, GPS, WFQ – Random Early Detection, Differentiated Services

UNIT VIII

PROTOCOLS FOR QOS SUPPORT9: RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

TEXT BOOKS:

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002.

REFERENCES:

1. Warland, Pravin Varaiya, "High performance communication networks", Second Edition, Jean Harcourt Asia Pvt. Ltd., , 2001.
2. Irvan Pepelnjk, Jim Guichard, Jeff Aparcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.
3. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York, 2004.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

INTEGRATED CIRCUIT FABRICATION TECHNOLOGY
(Open Elective)

Course Code: B3479

L P C
3 0 3

UNIT – I

Overview of Metal-Oxide-Semiconductor (MOS) Transistors: Introduction, Moore's law, Feature sizes of a transistors and a chip, Physics of silicon, Silicon Devices, MOS transistors.

UNIT – II

Silicon Wafer Preparation for MOS Transistor Fabrication: Introduction, Silicon Crystal Structure, Defects in a Silicon crystal, Single Crystalline Silicon – Wafer fabrication for MOS transistors applications, Fabrication and specifications of the silicon wafer, defects and impurities in the silicon wafer, wafer contaminations.

UNIT – III

MOS Transistor Process Flow: Introduction, MOS Transistor fabrication, Device Isolation, CMOS Fabrication.

UNIT – IV

Oxidation: Introduction, Structure of Silicon Dioxide, Oxidation equipment and process, Kinetics of Oxidation, Silicon Oxide Characterisation, Electrical Characterization of MOS capacitance.

Mask: Introduction, Properties of Mask, Types of masks and mask fabrication techniques.

UNIT – V

Lithography: Introduction, Photolithography Process, Photo-resist, Non-photo-resist, Ion – Beam Lithography.

Etching: Introduction, Etching Techniques, Wet Etching, Dry Etching.

UNIT – VI

Diffusion: Introduction, Diffusion Equipment and Process, Diffusion Models, Modification of Fick's Law, Oxidation Effects on Diffusion.

UNIT – VII

Ion – Implantation: Introduction, Ion – Implantation Equipment and parameters, Advantages and Disadvantages.

UNIT – VIII

Thin Film Deposition: Introduction, Film-Deposition Techniques, Metal Wirings and Contacts, Metal Film Deposition Techniques, Film thickness Measurements.

TEXT BOOKS:

1. Gouranga Bose, "IC Fabrication Tech", McGraw Hill Education (India) Edition 2014.
2. S. M. SZE, "VLSI Technology", Second Edition, Tata McGraw Hill Publishing Company Limited 2008.

REFERENCE BOOKS:

1. S. M. SZE, "Semiconductor Devices – Physics and Technology", 2nd Edition, Gurukripa Enterprises, Delhi, 2009

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

NANO TECHNOLOGY APPLICATIONS TO ELECTRICAL ENGINEERING
(Open Elective)

Course Code: B3371

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UNIT – I
INTRODUCTION

Nanotechnology and its role in sustainable energy- Energy conversion process, Direct and in-direct energy conversion- Materials for: Light emitting diodes, Batteries, Advance turbines, Catalytic reactors, Capacitors and Fuel cells.

UNIT – II
RENEWABLE ENERGY TECHNOLOGY

Energy challenges -Development and implementation of renewable energy technologies - Nanotechnology enabled renewable energy technologies -Energy transport.

UNIT – III
RENEWABLE ENERGY CONVERSION AND STORAGE

Energy conversion and storage - Nano, micro, poly crystalline Silicon and amorphous Silicon for solar cells, Silicon-composite structure, Techniques for Si deposition.

UNIT – IV
MICRO FUEL-CELL TECHNOLOGY

Micro-fuel cell technologies, integration and performance of micro-fuel cell systems - Thin film and microfabrication methods - Design methodologies - Micro-fuel cell power sources.

UNIT – V
MICROFLUIDIC SYSTEMS-I

Nano-electromechanical systems and novel micro fluidic devices - Nano engines –Driving mechanisms.

UNIT –VI
MICROFLUIDIC SYSTEMS-II

Power generation - Microchannel battery - Micro heat engine (MHE) fabrication –Thermocapillary forces – Thermocapillary pumping (TCP) - Piezoelectric membrane.

UNIT – VII
HYDROGEN STORAGE METHODS-I

Hydrogen storage methods - Metal hydrides and size effects - Hydrogen storage capacity -Hydrogen reaction kinetics - Carbon-free cycle.

UNIT – VIII
HYDROGEN STORAGE METHODS-II

Gravimetric and volumetric storage capacities – Hydriding / Dehydriding kinetics - High enthalpy of formation and thermal management during the hydriding reaction.

TEXT BOOKS:

1. J. Twidell and T. Weir, *Renewable Energy Resources*, E & F N Spon Ltd, London, (1986).
2. Martin A Green, *Solar cells: Operating principles, technology and system applications*, Prentice Hall Inc, Englewood Cliffs, NJ, USA, (1981).
3. H J Moller, *Semiconductor for solar cells*, Artech House Inc, MA, USA, (1993).
4. Ben G Streetman, *Solis state electronic device*, Prentice Hall of India Pvt Ltd., New Delhi (1995).

REFERENCE BOOKS:

1. M.A. Kettani , *Direct energy conversion*, Addison Wesley Reading, (1970).
2. Linden , *Hand book of Batteries and fuel cells*, Mc Graw Hill, (1984).
3. Hoogers , *Fuel cell technology handbook*. CRC Press, (2003).
4. Vielstich, *Handbook of fuel cells: Fuel cell technology and applications*, Wiley, CRC Press, (2003).

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

SOLAR ENERGY AND APPLICATIONS
(Open Elective)

Course Code: B3372

L	P	C
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UNIT - I

PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and Sun shine, solar radiation data.

UNIT - II

SOLAR ENERGY COLLECTORS: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT - III

STORAGE AND APPLICATIONS: Different methods of solar energy storage, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating /cooling technique, solar distillation and drying.

UNIT - IV

PHOTO VOLTAICS (PV): Fundamentals of solar cells, types of solar cells, semiconducting materials, band gap theory, absorption of photons, excitations and photo emission of electrons, band engineering.

UNIT - V

PV CELL PROPERTIES: Solar cell properties and design, p-n junction photodiodes, depletion region, electrostatic field across the depletion layer, electron and holes transports, device physics, charge carrier generation, recombination and other losses, I-V characteristics, output power.

UNIT - VI

SOLAR CELL APPLICATIONS: PV cell interconnection, module structure and module fabrication, Equivalent circuits, load matching, efficiency, fill factor and optimization for maximum power, Design of stand-alone PV systems, system sizing, device structures, device construction, DC to AC conversion, inverters, on-site storage and grid connections.

UNIT - VII

COST ANALYSIS AND ENVIRONMENTAL ISSUES: Cost analysis and pay back calculations for different types of solar panels and collectors, installation and operating costs, Environmental and safety issues, protection systems, performance monitoring.

UNIT - VIII

ALTERNATIVE ENERGY SOURCES: Solar Energy: Types of devices for Solar Energy Collection, Thermal Storage System. Control Systems, Wind Energy, Availability, Wind Devices, Wind Characteristics, Performance of Turbines and systems.

TEXT BOOKS:

1. G. D. Rai (2009), *Non-Conventional Energy Sources*, 4th edition, Khanna Publishers, New Delhi.
2. Martin A. Green (2008), *Solar Cells: Operating Principles, Technology and system Applications*, 1st edition, Prentice Hall, New Delhi.

REFERENCES BOOKS:

1. Sukatme (2008), *Solar Energy*, 3rd Edition, McGraw Hill Companies, New Delhi.
2. D. Yogi gosuami, Frank Kreith, Jan F. Kreider (2000), *Principles of Solar Engineering*, 2nd edition, Taylor & Francis, USA.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

INDUSTRIAL ELECTRONICS
(Open Elective)

Course Code: B3373

L P C
3 0 3

UNIT - I

INTRODUCTION : Definition – Trends - Control Methods: Standalone , PC Based (Real Time Operating Systems, Graphical User Interface , Simulation) - Applications: SPM, Robot, CNC, FMS, CIM.

UNIT – II

SIGNAL CONDITIONING : Introduction – Hardware - Digital I/O , Analog input – ADC , resolution , speed channels Filtering Noise using passive components – Resistors, capacitors - Amplifying signals using OP amps – Software - Digital Signal Processing – Low pass , high pass , notch filtering

UNIT – III

PRECISION MECHANICAL SYSTEMS : Pneumatic Actuation Systems - Electro-pneumatic Actuation Systems - Hydraulic Actuation Systems - Electro-hydraulic Actuation Systems - Timing Belts – Ball Screw and Nut - Linear Motion Guides - Linear Bearings - Harmonic Transmission - Bearings- Motor / Drive Selection.

UNIT – IV

ELECTRONIC INTERFACE SUBSYSTEMS : TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids , motors Isolation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers , over current sensing , resettable fuses , thermal dissipation - Power Supply - Bipolar transistors/ mosfets

UNIT – V

ELECTROMECHANICAL DRIVES : Relays and Solenoids - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors - 4-quadrant servo drives , PWM's - Pulse Width Modulation – Variable Frequency Drives, Vector Drives - Drive System load calculation.

UNIT – VI

MICROCONTROLLERS OVERVIEW : 8051 Microcontroller , micro processor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming – Assembly , C (LED Blinking , Voltage measurement using ADC).

UNIT – VII

PROGRAMMABLE LOGIC CONTROLLERS : Basic Structure - Programming : Ladder diagram - Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling - Analog input / output - PLC Selection - Application.

Unit – VIII

PROGRAMMABLE MOTION CONTROLLERS : Introduction - System Transfer Function – Laplace transform and its application in analysing differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers- P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal- S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , Go to Position - Applications : SPM, Robotics.

TEXT BOOKS :

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

REFERENCES :

1. Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
2. Mechatronics – N. Shanmugam / Anuradha Agencies Publishers.
3. Mechatronics System Design / Devdas shetty/Richard/Thomson.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

ENERGY MANAGEMENT AND AUDIT
(Open Elective)

Course Code: B3374

L	P	C
3	0	3

UNIT - I

INTRODUCTION: Principles of Energy Management, Managerial Organization. Functional Areas for Manufacturing Industry, Process Industry, Commerce, Government. Role of Energy Manager in each of the organization. Initiating, Organizing and Managing Energy Management Programs.

UNIT - II

ENERGY AUDIT: Definition and Concepts, Types of Energy Audits, Basic Energy Concepts. Resources for Plant Energy Studies, Data Gathering, Analytical Techniques. Energy Conservation: Technologies for Energy Conservation, Design for Conservation of Energy materials, energy flow networks, critical assessment of energy usage, formulation of objectives and constraints, synthesis of alternative options and technical analysis of options, process integration.

UNIT - III

ECONOMIC ANALYSIS: Scope, Characterization of an Investment Project, Types of Depreciation, Time Value of money, budget considerations, Risk Analysis.

UNIT - IV

METHODS OF EVALUATION OF PROJECTS: Payback, Annualized Costs, Investor's Rate of return, Present worth, Internal Rate of Return. Pros and Cons of the common methods of analysis, replacement analysis. Energy Consultant: Need of Energy Consultant, Consultant Selection Criteria.

UNIT - V

DEMAND SIDE MANAGEMENT: Concept and Scope of Demand Side Management, Evolution of Demand Side Management, DSM Strategy, Planning, Implementation and its application. Customer Acceptance & its implementation issues. National and International Experiences with DSM.

UNIT - VI

VOLTAGE AND REACTIVE POWER IN DISTRIBUTION SYSTEM: Voltage and reactive power calculations and control: Voltage classes and nomenclature, voltage drop calculations, Voltage control, VAR requirements and power factor, Capacitors unit and bank rating, Protection of capacitors and switching, Controls for switched capacitors and fields testing.

UNIT - VII

EFFICIENCY IN LIGHTING SYSTEM: Load scheduling/shifting, Lighting- lighting levels, efficient options, fixtures, day lighting, timers, Energy efficient windows. UPS selection, Installation operation and maintenance

UNIT - VIII

EFFICIENCY IN MOTORS: Motor drives- motor efficiency testing, energy efficient motors, and motor speed control.. Indian Electricity Act 1956, Distribution Code and Electricity Bill 2003

TEXT BOOKS:

1. W. R. Murphy, G. McKay (2008), *Energy Management*, 1st edition, B.S. Publications, New Delhi.
2. Tripathy S. C., "Electric Energy Utilization and conservation", Tata McGraw Hill.
3. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982.

REFERENCE BOOKS:

1. B. Smith (2007), *Energy Management Principles*, 1st edition, Pergamon Press, Inc., England.
2. Energy Management Handbook, Edited by W.C. Turner, Wiley, New York, 1982.
3. IEEE Bronze Book, 'Recommended Practice for Energy Conservation and cost effective planning in Industrial facilities, IEEE Press

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

NSS SYLLABUS FOR HONOURS/PASS/GENERAL COURSES
(Open Elective)

Course Code: B3901

L	P	C
2	2	3

Unit-01: Introduction and Basic Concepts of NSS

- a) History, philosophy, aims & objectives of NSS
- b) Emblem, flag, motto, song, badge etc.
- c) Organizational structure, roles and responsibilities of various NSS functionaries

Unit-02: NSS Programmes and Activities

- a) Concept of regular activities, special camping, Day Camps
- b) Basis of adoption of village/slums, Methodology of conducting Survey
- c) Financial pattern of the scheme
- d) Other youth prog./schemes of GOI
- e) Coordination with different agencies
- f) Maintenance of the Diary

Unit-03: Understanding Youth

- a) Definition, profile of youth, categories of youth
- b) Issues, challenges and opportunities for youth
- c) Youth as an agent of social change

Unit-04: Community Mobilisation

- a) Mapping of community stakeholders
- b) Designing the message in the context of the problem and the culture of the community
- c) Identifying methods of mobilization
- d) Youth-adult partnership

Unit-05: Volunteerism and Shramdan

- a) Indian Tradition of volunteerism
- b) Needs & importance of volunteerism
- c) Motivation and Constraints of Volunteerism
- d) Shramdan as a part of volunteerism

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

INTELLECTUAL PROPERTY RIGHTS
(Open Elective)

Course Code: **B3902**

L P C
3 0 3

UNIT - I

INTRODUCTION TO INTELLECTUAL PROPERTY: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT - II

TRADE MARKS: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trademarks, trade mark registration process.

UNIT - III

LAW OF COPY RIGHTS : Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

LAW OF PATENTS: Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT - IV

TRADE SECRETS: Trade secret law, determination of trade secret status, liability for misappropriations of trade secrets, protection for submission, and trade secret litigation.

UNFAIR COMPETITION: Misappropriation right of publicity, false advertising.

UNIT - V

GEOGRAPHICAL INDICATIONS: Introduction to geographical indication, Geographical indication protection, Importance to protect geographical indications.

UNIT - VI

INDUSTRIAL DESIGNS: Introduction to industrial design, industrial designs protection, Kinds of protection provided to industrial designs, Rights to owner of industrial designs.

UNIT - VII

OVERVIEW OF BIOTECHNOLOGY AND INTELLECTUAL PROPERTY: Biotechnology Research and Intellectual Property Rights Management, Licensing and Enforcing Intellectual Property, Commercializing Biotechnology Invention.

UNIT - VIII

NEW DEVELOPMENT OF IPR: New developments in Intellectual Property at International and National level. Intellectual property audits.

TEXT BOOKS:

1. Deborah. E. Bouchoux 4th Edition (2012), *Intellectual property*, Cengage learning, India.
2. T. M Murray and M.J. Mehlman, *Encyclopedia of Ethical, Legal and Policy issues in Biotechnology*, John Wiley & Sons 2000

REFERENCE BOOKS:

1. Prabudda ganguli (2003), *Intellectual property right*, Tata McGraw Hill Publishing company Ltd., India.
2. P.N. Cheremisinoff, R.P. Ouellette and R.M. Bartholomew, *Biotechnology Applications and Research*, Technomic Publishing Co., Inc. USA, 1985
3. P. Narayanan; *Law of Copyright and Industrial Designs*; Eastern law House, Delhi, 2010

VARDHAMAN COLLEGE OF ENGINEERING (AUTONOMOUS)

M. Tech. PEED I / II SEMESTER

TECHNICAL SEMINAR

Course Code: B3305/B3310

L T P C
- - - 2

1. OBJECTIVE:

Seminar is an important component of learning in an Engineering College, where the student gets acquainted with preparing a report & presentation on a topic.

2. PERIODICITY / FREQUENCY OF EVALUATION: Twice

3. PARAMETERS OF EVALUATION:

- i. The seminar shall have two components, one chosen by the student from the course-work without repetition and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work.
- ii. The two components of the seminar are distributed between two halves of the semester and are evaluated for 100 marks each. The average of the two components shall be taken as the final score.
- iii. The students shall be required to submit the rough drafts of the seminar outputs within one week of the commencement of the class work.
- iv. Supervisor shall make suggestions for modification in the rough draft. The final draft shall be presented by the student within a week thereafter.
- v. Presentation schedules will be prepared by different Departments in line with the academic calendar.

The Seminars shall be evaluated in two stages as follows:

A. Rough Draft

In this stage, the student should collect information from various sources on the topic and collate them in a systematic manner. He/She may take the help of the concerned supervisor.

The report should be typed in "MS-Word" file with "calibri" font, with font size of 16 for main heading, 14 for sub-headings and 11 for the body text. The contents should also be arranged in Power Point Presentation with relevant diagrams, pictures and illustrations. It should normally contain 18 to 25 slides, consisting of the followings:

1.	Topic, name of the student & guide	1 Slide
2.	List of contents	1 Slide
3.	Introduction	1 - 2 Slides
4.	Descriptions of the topic (point-wise)	7 - 10 Slides
5.	Images, circuits etc.	6 - 8 Slides
6.	Conclusion	1 - 2 Slides
7.	References/Bibliography	1 Slide

The soft copy of the rough draft of the seminar presentation in MS Power Point format along with the draft Report should be submitted to the concerned supervisor, with a copy to the concerned HOD within 30 days of the commencement of class work.

The evaluation of the Rough draft shall generally be based upon the following.

1.	Punctuality in submission of rough draft and discussion	4 Marks
2.	Resources from which the seminar have been based	4 Marks
3.	Report	6 Marks
4.	Lay out, and content of Presentation	6 Marks
5.	Depth of the students knowledge in the subject	10Marks
Total		30 Marks

After evaluation of the first draft the supervisor shall suggest further reading, additional work and fine tuning, to improve the quality of the seminar work.

Within 7 days of the submission of the rough draft, the students are to submit the final draft incorporating the suggestions made by the supervisor.

B. Presentation:

After finalization of the final draft, the students shall be allotted dates for presentation (in the designated seminar classes) and they shall then present it in presence students, supervisor, faculties of the department and at least one faculty from some department / other department.

The student shall submit 3 copies of the Report neatly bound along with 2 soft copies of the PPT in DVD medium. The students shall also distribute the title and abstract of the seminar in hard copy to the audience. The final presentation has to be delivered with 18-25 slides.

The evaluation of the Presentation shall generally be based upon the following.

1.	Contents	20 Marks
2.	Delivery	20 Marks
3.	Relevance and interest the topic creates	10 Marks
4.	Ability to involve the spectators	10Marks
5.	Question answer session	10 Marks
Total		70 Marks

4. WHO WILL EVALUATE?

The presentation of the seminar topics shall be made before an internal evaluation committee comprising the Head of the Department or his/her nominee, seminar supervisor and a senior faculty of the department / other department.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. PEED III SEMESTER

COMPREHENSIVE VIVA

Course Code: **B3311**

L T P C
- - - 4

1. OBJECTIVE:

- To enable the examiners to assess the candidate's knowledge in his or her particular field of learning.
- To test the student's awareness of the latest developments and relate them to the knowledge acquired during the classroom teaching.

2. PARAMETERS OF EVALUATION:

Subject Knowledge	Current Awareness	Career Orientation	Communication Skills	Total
40	20	20	20	100

3. WHO WILL EVALUATE?

The comprehensive Viva will be conducted by a committee comprising Head of the Department or his/her nominee, two senior faculty of the respective department and an external examiner from outside the college. The comprehensive viva shall be evaluated for **100** marks at the end of III semester. A minimum of **50%** of maximum marks shall be obtained to earn the corresponding credits.

4. PERIODICITY / FREQUENCY OF EVALUATION: Once

5. PEDAGOGY:

- The viva will be held on a face to face basis.
- The students will be expected to answer the questions related to latest developments and all courses taken till date.
- Viva voce will be conducted within week before the beginning of midterm examinations. However, in exceptional circumstances it can be scheduled immediately after the end of midterm examinations.
- Students will have to make themselves available on the date of the viva voce.

VARDHAMAN COLLEGE OF ENGINEERING (AUTONOMOUS)

M. Tech. PEED III/ IV SEMESTER

PROJECT WORK

Course Code: B3312/B3313

1. OBJECTIVE:

The main objective of the Project Work is for the students to learn and experience all the major phases and processes involved in solving “real life engineering problems”.

2. EXPECTED OUTCOME:

The major outcome of the M. Tech project must be well-trained students. More specifically students must have acquired:

- System integration skills
- Documentation skills
- Project management skills
- Problem solving skills

3. PROJECT SELECTION:

Projects are suggested by the faculty, with or without collaboration with an industry. All faculty are to suggest projects. Students are also encouraged to give project proposals after identifying a faculty who would be willing to supervise the work. A Project brief is to be given by the faculty to the group defining the project comprehensively.

All M. Tech major projects are to be done in the Institute. For industry specified projects, students will be permitted to spend 1-2 weeks in the industry on recommendation by the supervisor. The number of students per batch should be 1.

4. WHO WILL EVALUATE?

The end semester examination shall be based on the report submitted and a viva-voce exam for 140 marks by committee comprising of the Head of the Department, project supervisor and an external examiner.

5. EVALUATION:

The basic purpose is to assess the student competencies with regard to his project work. More specifically to assess the student's individual contribution to the project, to establish the level of understanding of basic theoretical knowledge relevant to the project and to ensure that the student has good understanding and appreciation of design and development decisions taken in the course of the project. It is desirable that all faculty members are present for the evaluations as this is a platform to get to know the student projects and to motivate the students to do good projects. The faculty should adopt a clear and consistent pattern of asking questions from general to specific aspects of the project. The presentation and evaluation is open to other students of the department.

The project work shall be evaluated for 300 marks out of which 160 marks for internal evaluation and 140 marks for end-semester evaluation. The evaluation shall be done on the following basis

Semester III	Semester IV
Preliminary Evaluation - 100 marks	Design Evaluation I - 30 marks
	Design Evaluation II - 30 marks
	Final Evaluation – 140 marks

6. GUIDELINES FOR THE PREPARATION OF M. TECH PROJECT REPORTS

6.1 Project reports should be typed neatly only on one side of the paper with 1.5 or double line spacing on a A4 size bond paper (210 x 297 mm). The margins should be: Left - 1.25", Right - 1", Top and Bottom - 0.75".

6.2 The total number of reports to be prepared are:

- One copy to the department
- One copy to the concerned guide(s)
- One copy to the candidate.

6.3 Before taking the final printout, the approval of the concerned guide(s) is mandatory and suggested corrections, if any, must be incorporated.

6.4 For making copies dry tone Xerox is suggested.

6.5 Every copy of the report must contain

- Inner title page (White)

- Outer title page with a plastic cover
- Certificate in the format enclosed both from the college and the organization where the project is carried out.
- An abstract (synopsis) not exceeding 100 words, indicating salient features of the work.

6.6. The organization of the report should be as follows:

1.	Inner title page	Usually numbered in roman
2.	Abstract or Synopsis	
3.	Acknowledgments	
4.	Table of Contents	
5.	List of table & figures (optional)	

6.7. Chapters(to be numbered) containing Introduction, which usually specifies the scope of work and its importance and relation to previous work and the present developments, Main body of the report divided appropriately into chapters, sections and subsections.

- The chapters, sections and subsections may be numbered in the decimal form for e.g. Chapter 2, sections as 2.1, 2.2 etc., and subsections as 2.2.3, 2.5.1 etc.
- The report should be typed in “MS-Word” file with “calibri” font. The chapter must be left or right justified (font size 16). Followed by the title of chapter centered (font size 18), section/subsection numbers along with their headings must be left justified with section number and its heading in font size 16 and subsection and its heading in font size 14. The body or the text of the report should have font size 11.
- The figures and tables must be numbered chapter wise for e.g.: Fig. 2.1 Block diagram of a serial binary adder, Table 3.1 Primitive flow table, etc.
- The last chapter should contain the summary of the work carried, contributions if any, their utility along with the scope for further work.

6.8. **Reference OR Bibliography:** The references should be **numbered serially** in the order of their occurrence in the text and their numbers should be indicated within square brackets for e.g. [3]. The section on references should list them in serial order in the following format.

1. For textbooks - A.V. Oppenheim and R.W. Schafer, Digital Signal Processing, Englewood, N.J., Prentice Hall, 3 Edition, 1975.
2. For papers - Devid, Insulation design to combat pollution problem, Proc of IEEE, PAS, Vol 71, Aug 1981, pp 1901-1907.

6.9. Only SI units are to be used in the report. Important equations must be numbered in decimal form for e.g. $V = IZ$ **(3.2)**

6.10. All equation numbers should be right justified.

6.11. The project report should be brief and include descriptions of work carried out by others only to the minimum extent necessary. Verbatim reproduction of material available elsewhere should be strictly avoided. Where short excerpts from published work are desired to be included, they should be within quotation marks appropriately referenced.

6.12. Proper attention is to be paid not only to the technical contents but also to the organization of the report and clarity of the expression. Due care should be taken to avoid spelling and typing errors. The student should note that report-write-up forms the important component in the overall evaluation of the project

6.13. Hardware projects must include: the component layout, complete circuit with the component list containing the name of the component, numbers used, etc. and the main component data sheets as Appendix. At the time of report submissions, the students must hand over a copy of these details to the project coordinator and see that they are entered in proper registers maintained in the department.

6.14. Software projects must include a virus free disc, containing the software developed by them along with the read me file. Read me file should contain the details of the variables used, salient features of the software and procedure of using them: compiling procedure, details of the computer hardware/software requirements to run the same, etc. If the developed software uses any public domain software downloaded from some site, then the address of the site along with the module name etc. must be included on a separate sheet. It must be properly acknowledged in the acknowledgments.

6.15. Sponsored Projects must also satisfy the above requirements along with statement of accounts, bills for the same duly attested by the concerned guides to process further, They must also produce NOC from the concerned guide before taking the internal viva examination.

6.16. The reports submitted to the department/guide(s) must be hard bounded, with a plastic covering.

6.17. Separator sheets, used if any, between chapters, should be of thin paper

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Shamshabad – 501 218, Hyderabad

Department of

CERTIFICATE

Certified that the project work entitled carried out by Mr./Ms., Roll Number, a bonafide student ofin partial fulfillment for the award of **Master of Technology** in of the Jawaharlal Nehru Technological University Hyderabad during the year It is certified that all corrections / suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

Name & Signature of the Guide

Name Signature of the HOD

Signature of the Principal

External Viva

Name of the examiners

- 1.
- 2.

Signature with date

Certificate issued at the Organization where the project was carried out

(On a separate sheet, If applicable)

NAME OF THE INDUSTRY / ORGANIZATION, Address with pin code

CERTIFICATE

Certified that the project work entitled carried out by Mr./Ms .
....., Roll Number....., a bonafide student of
.....in partial fulfillment for the award of **Master of Technology** in
..... of the Jawaharlal Nehru Technological University Hyderabad during the year
..... It is certified that, he/she has completed the project satisfactorily

Name & Signature of the Guide

Name & Signature of the Head of Organization

7. DISTRIBUTION OF MARKS FOR M.TECH DISSERTATION EVALUATION

S No.	Particulars	Max. Marks
1	Relevance of the subject in the present context	15
2	Literature Survey	15
3	Problem formulation	15
4	Experimental observation / theoretical modeling	15
5	Results – Presentation & Discussion	25
6	Conclusions and scope for future work	15
7	Overall presentation of the Thesis / Oral presentation	25
8	Project Report Writing	15
Total Marks		140