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

BACHELOR OF TECHNOLOGY

MECHANICAL ENGINEERING

(Accredited by NBA)

ACADEMIC REGULATIONS
COURSE STRUCTURE (VCE-R15)

CHOICE BASED CREDIT SYSTEM

B. Tech. - Regular Four Year Degree Program
(For batches admitted from the Academic Year 2015 - 2016)
&
B. Tech. - Lateral Entry Scheme
(For batches admitted from the Academic Year 2016 - 2017)

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC and ISO 9001:2008 Certified

Shamshabad - 501 218, Hyderabad, Telangana, India.

www.vardhaman.org

PRELIMINARY DEFINITIONS AND NOMENCLATURES

- "Autonomous Institution / College" means an institution / college designated as autonomous institute / college by University Grants Commission (UGC), as per the UGC Autonomous College Statutes.

- "Academic Autonomy" means freedom to a College in all aspects of conducting its academic programs, granted by the University for promoting excellence.

- "Commission" means University Grants Commission.

- "AICTE" means All India Council for Technical Education.

- "University" means Jawaharlal Nehru Technological University Hyderabad.

- "College" means Vardhaman College of Engineering, Hyderabad unless indicated otherwise by the context.

- "Program" means:
  - Bachelor of Technology (B. Tech.) Degree program
  - UG Degree Program: B. Tech.

- "Branch" means specialization in a program like B. Tech. Degree program in Civil Engineering,B. Tech. Degree program in Computer Science and Engineering etc.

- "Course" or "Subject" means a theory or practical subject, identified by its course-number and course-title, which is normally studied in a semester. For example, A3001: Linear Algebra and Ordinary Differential Equations, A3501: Programming for Problem Solving, etc. The description of allocation of course code is mentioned in the table 1.

Table 1: Course Code Description

First Digit	Second Digit	Third Digit	Fourth and Fifth Digits
Indicates Program	**Indicates Regulation**	**Indicates Department**	**Indicates Course Number**
A : B. Tech. **B** : M. Tech. **C** : MBA	**1** : R11 **2** : R14 **3** : R15	**0**: H&S/MBA **1** : Civil **2** : EEE **3** : MECH **4** : ECE **5**: ME **6** : IT	**01** **02** **..** **..**

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

FOREWORD

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

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

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

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

PRINCIPAL

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

INSTITUTE VISION, MISSION & QUALITY POLICY

Vision:

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

Mission:

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

Quality Policy:

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

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC and ISO 9001:2008 Certified

www.vardhaman.org

DEPARTMENT OF MECHANICAL ENGINEERING

Department Vision:

To be a premier center for producing competent mechanical engineers to cater the ever changing industrial demands and societal needs

Department Mission:

- To impart knowledge and skills in basic and applied areas of Mechanical Engineering through innovative learner-centric approach.
- To associate with industries and research organizations for gaining real time practical knowledge.
- To facilitate continuous learning based on dynamic needs of the society.

Program Educational Objectives (PEOs):

PEO1: Graduates make their way to the society with *scientific and technical knowledge* to identify, formulate and *solve Mechanical Engineering problems*.

PEO2: Graduates *adapt to rapidly changing environment* in the areas of Mechanical Engineering and *explore possible profession* in industry, academic, research and self-employment opportunities.

PEO3: Graduates *excel in career* by their *team-working ability* and *communicate effectively* to complete task with minimal resources.

PEO4: Graduates commit to *professional and ethical practices* encouraging *diversity, continuous improvement and lifelong learning.*

Program Outcomes (POs):

PO1: **Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems**.**

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

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

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

PO5: **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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

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

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

PO9: **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings**.**

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

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

PO12: **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO1: Demonstrate knowledge in the area of design, analysis and fabrication of mechanical systems.

PSO2: Apply learned concepts and management skills to associate professionally in industry or as an entrepreneur.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC and ISO 9001:2008 Certified

Shamshabad - 501 218, Hyderabad, Telangana, India.

www.vardhaman.org

ACADEMIC REGULATIONS

B. Tech. - Regular Four Year Degree Program
(For batches admitted from the Academic Year 2015 - 2016)
&
B. Tech. - Lateral Entry Scheme
(For batches admitted from the Academic Year 2016 - 2017)

For pursuing undergraduate Bachelor Degree Program of study in Engineering (B. Tech.) offered by Vardhaman College of Engineering under Choice Based Credit System (CBCS)and herein after Vardhaman College of Engineering is referred to as VCE.

1. APPLICABILITY

All the rules specified herein, approved by the Academic Council, will be in force and applicable to students admitted from the academic year 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 hereinafter shall be read as a whole for the purpose of interpretation and as and when a doubt arises, the interpretation of the Chairman of Academic Council is final. As per the requirements of statutory bodies, Principal, Vardhaman College of Engineering shall be the Chairman of the Academic Council.

3. ADMISSION

3.1. Admission into First year of Four Year B. Tech. Degree Program of study in Engineering:

3.1.1. Eligibility:

A student seeking admission into the first year of four-year B. Tech. Degree Program should have

(i) Passed either Intermediate Public Examination (I.P.E) conducted by the Board of Intermediate Education, Telangana, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by Board of Intermediate Education, Telangana or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Telangana or equivalent Diploma recognized by Board of Technical Education for admission as per the guidelines of Telangana State Council for Higher Education (TSCHE).

(ii) Secured a rank in the EAMCET examination conducted by TSCHE for allotment of a seat by the Convener, EAMCET, for admission into the program offered by the Institution.

3.1.2. Admission Procedure:

Admissions are made into the first year of four-year B.Tech. Degree Program as per the stipulations of TSCHE.

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

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

3.2. Admission into the Second year of Four Year B. Tech. Degree Program in Engineering

3.2.1. Eligibility:

A student seeking admission under lateral entry into the II year I semester B. Tech. Degree Program should have passed the qualifying exam (B.Sc. Mathematics & Diploma holders), based on the rank secured by the student at Engineering Common Entrance Test (FDH) in accordance with the instructions received from the Convener, ECET and Government of Telangana.

3.2.2. Admission Procedure:
Admissions are made into the II year of four-year B. Tech degree Program through Convener, ECET (FDH) 20% against the sanctioned strength in each Program of study under lateral entry scheme.

4. PROGRAMS OFFERED

Vardhaman College of Engineering, an autonomous college affiliated to JNTUH, offers the following B. Tech Programs of study leading to the award of B. Tech. Degree under the autonomous status.

1) B. Tech. - Civil Engineering
2) B. Tech. - Electrical and Electronics Engineering
3) B. Tech. - Mechanical Engineering
4) B. Tech. - Electronics and Communication Engineering
5) B. Tech. - Computer Science and Engineering
6) B. Tech. - Information Technology

5. MEDIUM OF INSTRUCTION

The medium of instruction is English for all the courses.

6. DURATION OF THE PROGRAMS

6.1. Minimum Duration

6.1.1. B. Tech. Degree program duration is for a period of minimum four academic years leading to the Degree of Bachelor of Technology (B.Tech.) of the Jawaharlal Nehru Technological University Hyderabad.

6.1.2. For students admitted under lateral entry scheme, B. Tech. Degree program duration is for a period of minimum three academic years leading to the Degree of Bachelor of Technology (B.Tech.) of the Jawaharlal Nehru Technological University Hyderabad (JNTUH).

6.2. Maximum Duration

6.2.1. The maximum period within which a student must complete a full-time academic program is eight academic years for B. Tech. If a student fails to complete the program within the maximum duration as specified above, student will forfeit the seat.

6.2.2. For students admitted under lateral entry scheme the maximum duration is six academic years. If a student fails to complete the program within the maximum duration as specified above, student will forfeit the seat.

6.2.3. The period is calculated from the academic year in which the student is admitted for the first time into the B. Tech. Degree Program.

7. SEMESTER STRUCTURE

The College follows semester system. An academic year consists of first semester, second semester and the summer term follows in sequence. The duration of each semester shall be of 23 weeks spell which includes time for course work, preparation and examinations. Each semester shall have a minimum of 90 instructional days.

Each semester has Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and curriculum/course structure as suggested by AICTE are followed.

Table 2: Academic Calendar

FIRST SEMESTER (23 weeks)	Instruction Period	:17 weeks	19 weeks
	Mid Semester Tests	:2 weeks	
	Preparation & Practical Examinations		2 weeks
	External Examinations		2 weeks
Semester Break			2 weeks
SECOND SEMESTER (23 weeks)	Instruction Period	:17 weeks	19 weeks
	Mid Semester Tests	:2 weeks	
	Preparation & Practical Examinations		2 weeks
	External Examinations		2 weeks
Summer Vacation			4 weeks

8. PROGRAM STRUCTURE

The Program of instruction consists of:

(i) Humanities, Social Sciences and Management, Basic Sciences, Basic Engineering, and other Mandatory / Audit courses.

(ii) Core Engineering courses impart skills among the students on the fundamentals of engineering in the branch concerned.

(iii) Elective courses enabling the students to take up a group of professional and open courses of their interest.

In addition, a student has to carry out a mini project, project work and technical seminar.

Every course of the B. Tech. Program will be placed in one of the ten groups of courses with credits as listed in the Table 3.

Note: All components prescribed in the curriculum of any program of study shall be conducted andevaluated.

Table 3: Group of courses

S. NO	GROUP OF COURSES	CATEGORY	RANGE OF TOTAL CREDITS
1	Humanities, Social Sciences and Management	HS	5% to 10%
2	Basic Sciences	BS	15% to 20%
3	Basic Engineering	BE	15% to 20%
4	Core Engineering	CE	30% to 40%
5	Professional Elective	PE	10% to 15%
6	Open Elective	OE	5% to 10%
7	Audit Course	AC	0%
8	Mini Project	MP	10% to 15%
9	Technical Seminar	TS	
10	Project Work	PW	

9. CREDIT BASED SYSTEM

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

9.1. The duration of each semester will normally be 23 weeks with 6 days a week (the second Saturday will be observed as holiday in a month). A working day shall have 6 lecture hours each of 60 minutes duration.

Table 4: Credit Representation

Lectures (hrs/wk/Sem.)	Tutorials (hrs/wk/Sem.)	Practical Work (hrs/wk/Sem.)	Credits (L: T: P)	Total Credits
3	0	0	3:0:0	3
3	1	0	3:0:0	3
3	2	0	3:1:0	4
4	0	0	4:0:0	4
4	1	0	4:0:0	4
0	2	4	0:1:2	3
0	0	3	0:0:2	2
0	0	2	0:0:1	1
0	0	20	0:0:12	12

9.2. The four-year curriculum of any B. Tech. program of study shall have 192 credits in total. The exact requirements of credits for each course will be as recommended by the Board of Studies concerned and approved by the Academic Council.

In the case of lateral entry students, B. Tech. program for III, IV, V, VI VII and VIII semesters of study shall have a total 144 credits.

9.3. For courses like mini project / project work / technical seminar, where formal contact hours are not specified, credits are assigned based on the complexity of the work.

10. 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, practical / computer aided engineering drawing lab. In addition, mini-project and technical seminar work shall be evaluated for 100 marks each and project work shall be evaluated for 200 marks.

10.1 Theory Courses

The evaluation of the students in each course is a continuous process and is based on their performance in different examinations and attendance as mentioned below:

Table 5: Method of Evaluation

Continuous Internal Evaluation	Mid Semester Test	15 Marks
	Online Objective Test	05 Marks
	Alternate Assessment	05 Marks
External Evaluation	End Semester Examination	75 Marks

10.1.1. Mid Semester Test

There will be two Mid Semester Tests in theory courses for a maximum of 15 marks, to be answered in one and half hour duration. The first Mid Semester Test will be held in the 09th week as per the given schedule for the first half of the total syllabus. The second Mid Semester Test will be held in the 18th week as per the given schedule with the second half of the total syllabus. In case a student does not appear for Mid Semester Test or underperformance, makeup test will be conducted upon the recommendations of the standing committee, subject to payment of a prescribed fee for each examination missed.

10.1.2. Online Objective Test

There will be one Online Objective Test in Theory Courses for a maximum of 05 marks, to be answered in 20 minutes duration. The Online Objective Test will be held in the 18th week as per the schedule declared covering all the units of syllabus. In case a student does not appear for the Online Objective Test due to any reason whatsoever, no makeup test shall be conducted.

10.1.3. Mid Marks

The final marks of Mid Exam, is the average of Mid Semester Test 1 and Mid Semester Test 2 along with Online Objective Test marks and subject wise aggregate percentage of attendance.

10.1.4. End Semester Examination

The end semester examination question paper in theory courses will be for a maximum of 75 marks to be answered in three hours duration. There shall be two questions of descriptive type from each unit with internal choice. Each question carries 15 marks. Each theory course shall consist of five 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.

10.2 Practical

Practical shall be evaluated for 100 marks, out of which 75 marks shall be for external examination and 25 marks for internal. The 25 internal marks are distributed as 15 marks for day-to-day evaluation 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.

10.3 For Engineering Drawing-I, Engineering Drawing-II and Machine Drawing, the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day evaluation and 10 marks for internal tests) and 75 marks for end examination. There shall be two internal evaluations in a semester and the average of the two internal evaluations is considered for the awarding internal marks.

10.4 The Computer Aided Engineering Drawing Lab wherever offered is to be treated as a practical subject. Evaluation method adopted for practical subjects shall be followed here as well.

10.5 Mini Project

The mini project in an industry shall be carried out during the summer break for a minimum of 4 weeks after the VI Semester and shall be completed before the start of the VII semester. A report has to be submitted for assessment to an internal evaluation committee comprising Head of the Department or his nominee and two faculty members of the department including the project supervisor for 100 marks. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits. The mini project and its report shall be evaluated in VII semester.

10.6 Technical Seminar

The seminar shall have two components; one chosen by the student from the course-work without repetition and another 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 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 40% of maximum marks shall be obtained to earn the corresponding credits.

10.7 Project Work

The project work shall be evaluated for 200 marks of which 50 marks shall be for internal evaluation and 150 marks for end-semester evaluation. The project work shall be somewhat innovative in nature, exploring the research bent of mind of the student. A project batch shall comprise of not more than four students.

In VIII semester, a mid-course review is conducted by Head of the Department and the project supervisor on the progress of the project for 25 marks. On completion of the project, a second evaluation is conducted for award of internal marks for another 25 marks before the report is submitted making the total internal marks to be 50. The end semester examination shall be based on the report submitted and a viva-voce exam for 150 marks by committee comprising of the Head of the Department, project supervisor and an external examiner. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

11. ATTENDANCE REQUIREMENTS TO APPEAR FOR THE END SEMESTER EXAMINATION

11.1. A student shall be eligible to appear for end semester examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.

11.2. Condonation of shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

11.3. Shortage of attendance that is below 65% in aggregate shall in no case be condoned.

11.4. The shortage of attendance shall not be condoned more than four times during the entire course of study.

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

11.6. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the current semester. The student may seek readmission for the semester when offered next. He will not be allowed to register for the subjects of the semester while he is in detention. A student detained due to shortage of attendance, will have to repeat that semester when offered next.

11.7. A stipulated fee shall be payable towards condonation of shortage of attendance to the College.

11.8. Attendance may also be condoned as per the recommendations of academic council for those who participate in prestigious sports, co-curricular and extra-curricular activities provided as per the Govt. of Telangana norms in vogue.

12. EVALUATION

Following procedure governs the evaluation.

12.1. The marks for the internal evaluation components will be added to the external evaluation marks secured in the end semester 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. Moderation is applied, if needed, based on the recommendations of results committee and then course-wise grade lists are finalized.

12.3. Student-wise tabulation is done and grade sheet is generated which is issued to the student.

13. REVALUATION

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

14. SUPPLEMENTARY EXAMINATION

14.1. 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 or absent in regular examinations. Such students writing supplementary examinations may have to write more than one examination per day.

14.2. Advanced Supplementary Examination:

Advanced supplementary examinations will be conducted for IV year II semester after announcement of regular results.

15. ACADEMIC REQUIREMENTS FOR PROMOTION / COMPLETION OF REGULAR B. TECH. PROGRAM OF STUDY

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

FOR STUDENTS ADMITTED INTO B. TECH. PROGRAM (BATCHES ADMITTED FROM 2015–2016)

i. A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical, design, drawing subject and project, if he secures not less than 35% of marks in the end semester examination and a minimum of 40% of marks in the sum of the internal evaluation and end semester examination taken together.

ii. In case of mini projectand technical seminar, a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each of them, if he secures not less than 40% 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 40% of marks on the aggregate in the internal evaluation and external end-evaluation taken together.

iv. A student shall be promoted from I Year to II Year program of study only if he fulfills the academic requirement of securing **24 out of 48** credits from the regular examinations held till the end of I year II semesterincluding supplementary examinations.

v. A student shall be promoted from II Year to III Year program of study only if he fulfills the academic requirement of securing **48 out of 96** credits from the regular examinations held till the end of II year II semesterincluding supplementary examinations.

vi. A student shall be promoted from III year to IV year program of study only if he fulfills the academic requirements of securing **72 out of 144** credits, from the regular examinations held till the end of III year II semester including supplementary examinations.

vii. A student shall register for all 192 credits and has to earn all the 192 credits. Marks obtained in best 184 credits shall be considered for the award of the class based on aggregate of grades.

viii. A student who fails to earn 192 credits as indicated in the course structure within **eight** academic years from the year of their admission shall forfeit his seat in the B. Tech. program and his admission stands cancelled.

FOR LATERAL ENTRY STUDENTS (BATCHES ADMITTED FROM 2016–2017)

i. A student shall be deemed to have satisfied the minimum academic requirements for each theory, practical, design, drawing subject or project, if he secures not less than 35% of marks in the end semester examination and a minimum of 40% of marks in the sum total of the internal evaluation and end semester examination taken together.

ii. In case of mini project and technical seminar, a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each of them, if he secures not less than 40% 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 40% of marks on the aggregate in the internal evaluation and external end-evaluation taken together.

iv. A student shall be promoted from II Year to III Year program of study only if he fulfills the academic requirement of securing **24 out of 48** credits from the regular examinations held till the end of II year II semester including supplementary examinations held till the end of II year II semester.

v. A student shall be promoted from III year to IV year program of study only if he fulfills the academic requirements of securing **48 out of 96** credits, from the regular examinations held till the end of III year II semester including supplementary examinations held till the end of III year II semester.

vi. A student shall register for all 144 credits and earn all the 144 credits. Marks obtained in best 136 credits shall be considered for the award of the class based on aggregate of grades.

vii. A student who fails to earn 144 credits as indicated in the course structure within **six** academic years from the year of his admission shall forfeit his seat in the B. Tech. Program and his admission stands cancelled.

16. TRANSITORY REGULATIONS

Students who are detained for lack 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 eight years, and a lateral entry student within six years, for the award of the B. Tech. Degree.

17. TRANSFER OF STUDENTS FROM OTHER COLLEGES/UNIVERSITIES

Transfer of students from other colleges or universities are permitted subjected to the rules and regulations of TSCHE (TE Department) and JNTUH in vogue.

18. TRANSCRIPTS

After successful completion of the entire program 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.

19. AWARD OF DEGREE

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

19.1. For students admitted into B.Tech. program (Batches admitted from 2015-2016)

Eligibility: A student shall be eligible for the award of B. Tech. Degree, if he fulfills all the following conditions:

- The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.
- The candidate shall register for 192 credits and has to secure all the 192 credits. Marks obtained in best 184 credits shall be considered for the award of the class based on aggregate of grades.
- The candidate has to obtain not less than 40% of marks (minimum requirement for declaring as passed).
- The candidate has no dues to the college, hostel, and library etc. and to any other amenities provided by the College.
- The candidate has no disciplinary action pending against him.

19.2. For lateral entry students (batches admitted from 2016–2017)

Eligibility: A student shall be eligible for the award of B. Tech. Degree, if he fulfills all the following conditions:

- The candidate shall pursue a course of study for not less than three academic years and not more than six academic years.
- The candidate shall register for 144 credits and secure all 144 credits. Marks obtained in best 136 credits shall be considered for the award of the class based on aggregate of grades.
- The candidate has to obtain not less than 40% of marks (minimum requirement for declaring as passed).
- The candidate has no dues to the college, hostel, and library etc. and to any other amenities provided by the College.
- The candidate has no disciplinary action pending against him.

19.3. Award of class

After a student has satisfied the requirement prescribed for the completion of the Program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes shown in Table 7:

Table 7: Declaration of Class based on CGPA (Cumulative Grade Point Average)

Class Awarded	Grades to be Secured	
First Class with Distinction	≥ 8.0 CGPA	From the aggregate marks secured from **184** Credits for Regular Students and **136** Credits for Lateral Entry Students.
First Class	6.5 to <8.0 CGPA	
Second Class	5.5 to <6.5 CGPA	
Pass Class	5.0 to <5.5 CGPA	
Fail	Below 5.0 CGPA	

19.4. 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 8.

Table 8: Percentage Equivalence of *Grade Points* (For a 10-Point Scale)

Grade	Grade Points (GP)	Percentage of Marks
O	10	≥ 80 and above
A+	9	≥ 70 and < 80
A	8	≥ 60 and < 70
B+	7	≥ 55 and < 60
B	6	≥ 50 and < 55
C	5	≥ 45 and < 50
P	4	≥ 40 and < 45
F	0	Below 40
AB	0	

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

Percentage of marks = (CGPA-0.5) X 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.

$$\mathbf{SGPA\ (S_i) = \sum (C_i x\ G_i) / \sum C_i}$$

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

$$\mathbf{CGPA = \sum (C_i\ x\ S_i) / \sum C_i}$$

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

20. ADDITIONAL ACADEMIC REGULATIONS

20.1 Courses like projects / mini projects / seminars can be repeated only by re-registering for all the components in that semester.

20.2 When a student is absent for any examination (internal or external), he is treated as to have obtained absent in that component (course) and aggregate of marks is done accordingly.

20.3 When a component is cancelled as a penalty, he is awarded zero marks in that component.

21. REGISTRATION

21.1. Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar IN PERSON. It is absolutely compulsory for the student to register for courses in time. IN ABSENTIA registration will not be permitted under any circumstance.

21.2. Registration without fine: The courses prescribed for a semester can be registered on the date scheduled in the academic calendar. The registration is also permitted on the second day (which is the first working day of the semester) without fine.

21.3. Registration with fine: Late registration shall be permitted by the HOD concerned up to seven working days inclusive of the date of registration on payment of a late registration fee of stipulated amount.

21.4. Procedure to get permission for late registration: The student concerned shall apply with proper reason to the HOD concerned through the Academic Counselor to get the permission of the Dean (UG) for the late registration of the courses. Beyond the prescribed time limit, no student shall be permitted to register the courses for a particular semester.

22. 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. If the student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

II. If the student fails to satisfy the norms of discipline specified by the Institute from time to time.

23. CURRICULUM

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

II. The BOS for a program is completely responsible for designing the curriculum at least once in two years for that program.

24. WITHHOLDING OF RESULTS

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

25. GRIEVANCES REDRESSAL COMMITTEE

"Grievance and Redressal Committee" (General) constituted by the Principal shall deal in 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 and 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.

26. MALPRACTICE PREVENTION COMMITTEE

A malpractice prevention committee shall be constituted to examine and punish the student who involves in malpractice/behaves in an in-disciplinary manner during the examination. The committee shall consist of:

Principal
Subject expert
Head of the department to which the student belongs to
The invigilator concerned
Controller of Examinations

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

Any action on the part of student at the examination like trying to get undue advantage in the performance at

examinations, 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, evaluating 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 will be recommended for appropriate punishment after thorough enquiry.

27. 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.

28. STUDENTS' FEEDBACK

It is necessary for the College 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 is 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.

29. GRADUATION DAY

The College shall have its own annual *Graduation Day* for the distribution 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.

30. AWARD OF A RANK UNDER AUTONOMOUS SCHEME

30.1. 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., 4 years for B. Tech. and 3 years for B. Tech. under lateral entry scheme.

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

31. CODE OF CONDUCT

31.1. Each student shall conduct himself in a manner befitting his association with VCE.

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

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

31.4. Lack of courtesy, decorum, indecorous behaviour or untoward attitude both inside and outside the college premises is strictly prohibited. Willful damage or discard of Institute's property or the belongings of fellow students are not at all accepted. Creating disturbance in studies or adopting any unfair means during the examinations or breach of rules and regulations of the Institute or any such undesirable means and activities shall constitute violation of code of conduct for the student.

31.5. Ragging in any form is strictly prohibited and is considered a serious and punishable offence as per law. It will lead to the expulsion of the offender from the college.

31.6. 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.

31.7. 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.

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

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

32. 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:

a. Selective admission of students to a Program, so that merit and aptitude for the chosen technical branch or specialization are given due consideration.

b. Faculty recruitment and orientation, so that qualified teachers trained in good teaching methods, technical leadership and students' motivation are available.

c. Instructional/Laboratory facilities and related physical infrastructure, so that they are adequate and are at the contemporary level.

d. Access to good library resources and Information & Communication Technology **(ICT)** facilities, to develop the student's aptitude effectively.

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

a. 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.

b. Life-long learning opportunities for faculty, students and alumni, to facilitate their dynamic interaction with the society, industries and the world of work.

c. Generous use of ICT and other modern technologies in everyday activities.

33. GENERAL

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

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

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

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

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

COURSE STRUCTURE (VCE-R15)

B. TECH - MECHANICAL ENGINEERING

REGULATIONS: VCE-R15

I SEMESTER

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A3001	Mathematics - I	BS	4	1	0	4	25	75	100
A3002	Engineering Physics	BS	3	1	0	3	25	75	100
A3003	Engineering Chemistry	BS	3	1	0	3	25	75	100
A3301	Engineering Mechanics-I	BE	3	1	0	3	25	75	100
A3501	Computer Programming	BE	4	0	0	4	25	75	100
A3007	Engineering Physics and Engineering Chemistry Lab	BS	0	0	3	2	25	75	100
A3302	Engineering Drawing-I	BE	0	2	4	3	25	75	100
A3502	Computer Programming Through C Lab	BE	0	0	3	2	25	75	100
	TOTAL		**17**	**06**	**10**	**24**	**200**	**600**	**800**

II SEMESTER

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A3006	Mathematics – II	BS	4	1	0	4	25	75	100
A3005	Technical English	HS	3	0	0	3	25	75	100
A3004	Probability Theory and Numerical Methods	BS	3	1	0	3	25	75	100
A3402	Basic Electronics	BE	3	1	0	3	25	75	100
A3303	Engineering Mechanics-II	BE	4	1	0	4	25	75	100
A3008	English Language Communication Skills Lab	HS	0	0	3	2	25	75	100
A3304	Engineering Drawing-II	BE	0	2	4	3	25	75	100
A3305	Engineering Workshop	BE	0	0	3	2	25	75	100
	TOTAL		**17**	**06**	**10**	**24**	**200**	**600**	**800**

III SEMESTER

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A3307	Mechanics of Solids	CE	3	1	0	3	25	75	100
A3308	Mechanics of Fluids	CE	3	1	0	3	25	75	100
A3309	Thermodynamics	CE	4	0	0	4	25	75	100
A3310	Metallurgy & Material Science	BS	3	1	0	3	25	75	100
A3206	Electrical Technology	BE	3	1	0	3	25	75	100
A3311	Machine Drawing	CE	0	0	6	4	25	75	100
A3312	Mechanics of Solids & Metallurgy Lab	CE	0	0	3	2	25	75	100
A3209	Electrical and Electronics Engineering Lab	BE	0	0	3	2	25	75	100
A3021	Gender Sensitization	AC	0	3	0	0	25*	50*	75*
	TOTAL		**16**	**07**	**12**	**24**	**200**	**600**	**800**

IV SEMESTER

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A3010	Environmental Science	BS	3	0	0	3	25	75	100
A3011	Managerial Economics and Financial Analysis	HS	3	1	0	3	25	75	100
A3314	Thermal Engineering – I	CE	4	0	0	4	25	75	100
A3315	Production Technology – I	CE	3	1	0	3	25	75	100
A3316	Hydraulic Machines	CE	3	1	0	3	25	75	100
A3317	Kinematics of Machinery	CE	4	1	0	4	25	75	100
A3318	Fluid Mechanics and Hydraulic Machinery Lab	CE	0	0	3	2	25	75	100
A3326	Production Technology Lab	CE	0	0	3	2	25	75	100
	TOTAL		**20**	**04**	**06**	**24**	**200**	**600**	**800**

V SEMESTER

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A3319	Dynamics of Machinery	CE	4	1	0	4	25	75	100
A3320	Production Technology – II	CE	3	1	0	3	25	75	100
A3321	Thermal Engineering – II	CE	3	1	0	3	25	75	100
A3322	Design of Machine Members – I	CE	4	1	0	4	25	75	100
A3333	Operations Research	CE	3	1	0	3	25	75	100
A3323	Instrumentation and Control Systems	CE	3	1	0	3	25	75	100
A3324	Thermal Engineering & Fuels Lab	CE	0	0	3	2	25	75	100
A3325	Theory of Machines Lab	CE	0	0	3	2	25	75	100
A3012	Professional Ethics and Human Values	AC	3	0	0	0	25*	75*	100*
	TOTAL		**23**	**06**	**06**	**24**	**200**	**600**	**800**

VI SEMESTER

Code	Course	Category	Periods per Week			Credits	Scheme of Examination Maximum Marks		
			L	T	P		Internal	External	Total
A3327	Design of Machine Members – II	CE	3	1	0	3	25	75	100
A3328	Heat Transfer	CE	3	1	0	3	25	75	100
A3330	Metrology and Surface Engineering	CE	3	0	0	3	25	75	100
	Open Elective – I	OE	3	0	0	3	25	75	100
	Professional Elective - I	PE	4	0	0	4	25	75	100
	Professional Elective - II	PE	4	0	0	4	25	75	100
A3331	Heat Transfer Lab	CE	0	0	3	2	25	75	100
A3332	Metrology & Machine Tools Lab	CE	0	0	3	2	25	75	100
A3013	Intellectual Property Rights	AC	3	0	0	0	25*	75*	100*
	TOTAL		**23**	**02**	**06**	**24**	**200**	**600**	**800**

*Marks awarded for audit courses will not be considered for calculating SGPA and CGPA

VII SEMESTER									
Code	**Course**	**Category**	**Periods per Week**			**Credits**	**Scheme of Examination Maximum Marks**		
			L	**T**	**P**		**Internal**	**External**	**Total**
A3329	Finite Element Methods	CE	3	1	0	3	25	75	100
A3334	Computer Aided Design and Manufacturing	CE	3	1	0	3	25	75	100
A3014	Management Science	HS	3	1	0	3	25	75	100
	Open Elective - II	OE	3	0	0	3	25	75	100
	Professional Elective – III	PE	4	0	0	4	25	75	100
	Professional Elective – IV	PE	4	0	0	4	25	75	100
A3335	Computer Aided Design and Manufacturing Lab	CE	0	0	2	1	25	75	100
A3336	Production Drawing Practice and Instrumentation lab	CE	0	0	2	1	25	75	100
A3338	Mini Project	MP	0	0	0	2	100	0	100
		TOTAL	**20**	**03**	**04**	**24**	**300**	**600**	**900**

VIII SEMESTER									
Code	**Course**	**Category**	**Periods per Week**			**Credits**	**Scheme of Examination Maximum Marks**		
			L	**T**	**P**		**Internal**	**External**	**Total**
A3337	Refrigeration and Air Conditioning	CE	3	1	0	3	25	75	100
	Open Elective – III	OE	3	0	0	3	25	75	100
	Professional Elective – V	PE	4	0	0	4	25	75	100
A3339	Technical Seminar	TS	0	0	3	2	100	0	100
A3340	Project Work	PW	0	0	20	12	50	150	200
		TOTAL	**10**	**01**	**23**	**24**	**225**	**375**	**600**

B. TECH. - MECHANICAL ENGINEERING

REGULATIONS: VCE-R15

Professional Elective - I			
Code	**Course**	**Code**	**Course**
A3351	Automobile Engineering	**A3353**	Welding Technology
A3352	Advanced Strength of materials	**A3354**	Manufacturing of Composite Materials
Professional Elective - II			
Code	**Course**	**Code**	**Course**
A3355	Power Plant Engineering	**A3357**	Nanotechnology
A3356	Unconventional Manufacturing Processes	**A3358**	Production Planning and Control
Professional Elective - III			
Code	**Course**	**Code**	**Course**
A3359	Renewable Energy Systems	**A3361**	NDT Techniques
A3360	Design of Production Tooling	**A3362**	Materials for High Temperature Applications
Professional Elective - IV			
Code	**Course**	**Code**	**Course**
A3363	Gas Dynamics and Jet Propulsion	**A3365**	Robotics
A3364	Fatigue and Fracture Mechanics	**A3366**	Rapid Prototyping
Professional Elective - V			
Code	**Course**	**Code**	**Course**
A3367	Computational Fluid Dynamics	**A3369**	Micro Electro Mechanical Systems
A3368	Vibrations and structural Dynamics	**A3370**	Mechatronics
Open Electives			
Code	**Course**	**Code**	**Course**
A3576	Fundamentals of Database Management Systems	**A3577**	Fundamentals of Image Processing
A3578	Operating System Fundamentals	**A3579**	JAVA programming
A3676	Cyber Laws	**A3677**	E-Commerce Trends
A3678	Principles of Software Engineering	**A3679**	Scripting Languages
A3476	Digital Electronics	**A3477**	Principles of Analog and Digital Communications
A3478	Transducers and Measurements	**A3479**	Communication Networking Devices
A3276	Nano Technology Applications to Electrical Engineering	**A3277**	Industrial Electronics
A3278	Solar Energy and Applications	**A3279**	Energy Management and Audit
A3376	Elements of Mechanical Engineering	**A3377**	Basic Thermodynamics and Heat Transfer
A3378	Mechanical Measurements and Instrumentation	**A3379**	Engineering Optimization
A3176	Environmental pollution and management	**A3177**	Remote sensing and GIS
A3178	Disaster Management	**A3179**	Constructing planning and management
A3076	Entrepreneurship Development	**A3077**	Human Resource Management
A3078	Organization Behavior	**A3079**	Logistics and Supply Chain Management
A3080	National Service Scheme (NSS)	**A3680**	Python for Data Science
A3081	Basic Program in Entrepreneurship		

Course Categories

HS	–	Humanities and Social Sciences	**BS**	–	Basic Sciences
BE	–	Basic Engineering	**CE**	–	Core Engineering
AC*	–	Audit Course	**OE**	–	Open Elective
PE	–	Professional Elective	**MP**	–	Mini Project
TS	–	Technical Seminar	**PW**	–	Project Work

Note: Open electives to be offered will be notified by each department at the time of registration.

SYLLABI FOR
I SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

MATHEMATICS - I

Course Code: A3001

L	T	P	C
4	1	0	4

Course Overview:

This course develops the theory of differential equations and indicating its applications. This course deals with more advanced Engineering Mathematics topics which provide students with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. Topics include the differential equations of first order and their applications, higher order linear differential equations and their applications, Functions of single variable and multiple integrals, Laplace transforms, Vector integral theorems(Green's, Stoke's and Gauss's divergence theorems). The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Solve the first and higher order linear differential equations.

CO2. Make use of differential equations to solve orthogonal trajectories, rate of growth/decay, Newton's law of cooling, Electrical circuits and simple harmonic motion problems.

CO3. Examine extremum of a function of several variables and evaluate the multiple integrals.

CO4. Apply Laplace transforms to solve differential equations.

CO5. Evaluate line, surface and volume integrals using vector integral theorems.

B. Tech. ME I Semester **VCE-R15**

MATHEMATICS - I

Course Code: A3001

L	T	P	C
4	1	0	4

SYLLABUS

UNIT – I **(12 Lectures)**

DIFFERENTIAL EQUATIONS OF FIRST ORDER AND THEIR APPLICATIONS: Formation of a differential equation – Differential equations of first order and first degree – Linear equations, Bernoulli's equation, Exact equations and equations reducible to exact form - Applications of first order differential equations - Orthogonal trajectories - Newton's law of cooling - Law of natural growth and decay.

UNIT – II **(11 Lectures)**

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS: Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of the type $Q(x) = e^{ax}, \sin ax, \cos ax, x^n, e^{ax}V(x), x^nV(x)$ - Equations reducible to linear equations with constant coefficients – Cauchy's homogeneous linear equation – Legendre's linear equation - Method of variation of parameters - Applications to L - C - R Circuits and Simple Harmonic Motion.

UNIT – III **(13 Lectures)**

FUNCTIONS OF SINGLE AND SEVERAL VARIABLES, MULTIPLE INTEGRALS: Mean Value Theorems **-** Rolle's Theorem - Lagrange's mean value theorem – Cauchy's mean value theorem - Generalized mean value theorem (all theorems statements and their verification). Functions of several variables - Functional dependence - Jacobian - Maxima and Minima of functions of two variables – Lagrange's method of undetermined multipliers. Multiple integrals - Double and triple integrals - Change of order of integration - Change of variables in double integrals.

UNIT – IV **(10 Lectures)**

LAPLACE TRANSFORM AND ITS APPLICATIONS TO ORDINARY DIFFERENTIAL EQUATIONS: Laplace transforms of elementary functions - First shifting theorem - Change of scale property - Multiplication by t^n - Division by t - Laplace transforms of derivatives and integrals - Unit step function - Second shifting theorem - Periodic function - Evaluation of integrals by Laplace transforms - Inverse Laplace transforms - Method of partial fractions - Other methods of finding inverse transforms - Convolution theorem - Applications of Laplace transforms to ordinary differential equations.

UNIT-V **(10 Lectures)**

VECTOR CALCULUS: Scalar and vector point functions - Gradient, divergence, curl and their related properties - Solenoidal and irrotational vector point functions - Scalar potential function - Laplacian operator - Line integral - work done - surface integrals - volume integral - Vector integral theorems - Green's theorem in a plane - Stoke's theorem - Gauss divergence theorem (all theorem statements and their verification).

TEXT BOOKS:

1. B S Grewal (2012), *Higher Engineering Mathematics*, 42nd Edition, New Delhi, Khanna Publishers.
2. B V Ramana (2010), *Engineering Mathematics*, New Delhi, Tata Mc Graw Hill Publishing Co. Ltd

REFERENCE BOOKS:

1. Kreyszig Ervin, *Advanced Engineering Mathematics,* 10th *Edition,* New Jersy, John *Wiley* & Sons
2. T K V Iyengar, B Krishna Gandhi & Others. (2011), *Engineering Mathematics Vol - I*, Tenth Revised Edition, New Delhi, S.Chand & Co.Ltd.
3. H K Dass, Er Rajnish Varma (2012), *Higher Engineering Mathematics*, Second Revised Edition, New Delhi, S Chand & Co. Ltd

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

ENGINEERING PHYSICS

Course Code: A3002

L	T	P	C
3	1	0	3

Course Overview:

Engineering physics is the study of the combined disciplines of physics, engineering and mathematics in order to develop an understanding of the interrelationships of these three disciplines. Fundamental physics is combined with problem **solving** and engineering skills, which then has broad applications. Career paths for Engineering physics are usually "engineering, applied science or applied physics through research, teaching or entrepreneurial engineering". This interdisciplinary knowledge is designed for the continuous innovation occurring with technology.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Analyze crystal structures in terms of lattice parameters and interpret the structures using X-ray diffraction methods.

CO2. Apply the principles of quantum mechanics to analyze the properties of the semiconducting materials.

CO3. Categorize nano and dielectric materials. Discuss synthesis and react to environmental concerns due to nanotechnology.

CO4. Categorize magnetic materials and objective their role in science and technology. Apply magnetism to explain superconductivity.

CO5. Illustrate working of a laser and examine the communication systems using optical fibers.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

ENGINEERING PHYSICS

Course Code: A3002

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I **(10 Lectures)**

INTRODUCTION TO CRYSTALLOGRAPHY: Space lattice, Unit cell, lattice parameters, Atomic radius, co-ordination number and packing factor of SC, BCC, FCC, and diamond, Miller indices, Crystal planes and directions, Interplanar spacing of orthogonal crystal systems.

X-Ray Diffraction: Basic principles of X-ray diffraction, Bragg's law, Laue method, Rotating Crystal Method, Powder method, applications of X- ray diffraction.

UNIT - II **(8 Lectures)**

PRINCIPLES OF QUANTUM MECHANICS: Waves and particles, De Broglie hypothesis, matter waves, Davisson and Germer experiment, G. P. Thomson experiment, Schrödinger's time independent wave equation, Application of Schrodinger equation (particle in one dimensional potential box).

SEMICONDUCTOR PHYSICS: Intrinsic and Extrinsic Semiconductors, p-n junction diode, Forward and reverse bias, V-I characteristics, Fermi level in Intrinsic and Extrinsic semiconductors (qualitative), Applications of Semiconductors (LED).

UNIT - III **(8 Lectures)**

NANO SCIENCE: Origin of Nano science, Nano scale, surface to volume ratio, Bottom-up and Top-down approaches; Synthesis: Sol-gel, Chemical vapour deposition, physical vapour deposition, pulsed laser vapour deposition methods; Applications of Nanomaterials.

DIELECTRIC PROPERTIES: Electric dipole moment, dielectric constant, Types of polarization (qualitative), Local Field, Clausius – Mossotti Equation, Piezoelectricity and Ferroelectricity and their applications.

UNIT - IV **(8 Lectures)**

MAGNETIC PROPERTIES: Magnetic moment, classification of magnetic materials, Weiss theory of ferromagnetism, hysteresis curve, soft and hard magnetic materials and their applications.

SUPERCONDUCTORS: Meissner effect, BCS Theory, Type-I and Type-II Superconductors, High temperature Superconductors, applications of superconductors.

UNIT - V **(8 Lectures)**

LASERS: Characteristics of lasers, spontaneous and stimulated emission of radiation, population inversion, Einstein's coefficients, Pumping mechanisms, Ruby laser, Helium-Neon laser, semiconductor diode laser, applications of lasers.

FIBER OPTICS: Principle of optical fiber, acceptance angle, Numerical aperture, types of optical fibers, attenuation of signal in optical fibers, Functioning of Optical Fiber communication system, applications of optical fibers.

TEXT BOOKS:

1. Pillai, S.O. (2007), *Engineering Physics*, New Age International.
2. Arumugam.M (2005), *Engineering Physics*, Anuradha Publishers.

REFERENCE BOOKS:

1. Rajendran.V and Marikani.A(2004), *Engineering Physics,* Tata Mc Graw Hill Publications Ltd, 3rd Edition
2. H K Dass, Er Rajnish Varma (2012), *HigherEngineering Mathematics,* Second Revised Edition, S. Chand & Co. Ltd, New Delhi.
3. P. Sarah and M. Geetha (2012), *Engineering Physics and Engineering Chemistry*, VGS Book links, Hyderbad
4. M. Ratner, D. Ratner (2003), *Nanotechnology,* Pearson Edition, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

ENGINEERING CHEMISTRY

Course Code: A3003

L	T	P	C
3	1	0	3

Course Overview:

This course will involve minimum lecturing, content will be delivered through assigned reading and reinforced with large and small group discussions, as well as assigned in class (and occasional out of class) group activities. Water and its treatment for various purposes, engineering materials such as plastics, composites, ceramic, abrasives, their preparation, properties and applications, conventional and non- conventional energy sources, nuclear, solar, various batteries, combustion calculations, corrosion and control of metallic materials.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Apply the knowledge of standard electrode potentials of various metals and nonmetals to protect them from corrosion.

CO2. Identify difference and similarities of three types of Batteries.

CO3. Compare different methods of softening of hard water.

CO4. Apply the knowledge of Materials, Fuels and Nano particles in controlling pollution.

CO5. Compare and contrast the chemical behavior, properties and applications of engineering substances.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

ENGINEERING CHEMISTRY

Course Code: A3003

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I **(11 Lectures)**

ELECTROCHEMISTRY: Introduction, Conductance-Specific, Equivalent and Molar conductance, effect of dilution on electrolytic conductance. EMF: Galvanic Cells, Nernst equation, numerical problems. Concept of concentration cells, electro chemical series-applications.

BATTERIES: Primary and secondary cells, (Lechlanche cell, Lead-Acid cell, Ni- Cd cell, Lithium cells). Applications of batteries, Fuel cells: Hydrogen – Oxygen fuel cell, advantages of fuel cells.

CORROSION AND ITS CONTROL: Introduction, causes of corrosion, theories of corrosion – Chemical, Electrochemical corrosion. Corrosion control methods – Cathodic protection, sacrificial anode, impressed current cathode. Surface coatings – electroplating, metal cladding. Galvanizing.

UNIT – II **(8 Lectures)**

WATER TREATMENT: Introduction to Hardness, causes, expression of hardness, units. Types of hardness, numerical problems. Treatment of water: Internal treatment, types & External treatment: Zeolite process, Ion exchange process and Lime- soda process. Numerical problems on lime- soda and Zeolite process. Treatment of brackish water: Reverse osmosis and Electro dialysis.

UNIT – III **(10 Lectures)**

ENGINEERING MATERIALS:

A) HIGH POLYMERS: Introduction, Types of Polymerization. Plastics: Thermoplastic resins & Thermosetting resins, preparation, properties and engineering applications of plastics: polyethylene, Poly vinyl chloride, Teflon, Nylon. Rubbers: Natural rubber and vulcanization. Synthetic rubbers: Buna-S, Buna-N. Fibers: Polyester- applications. Conducting Polymers: Classification, doping and applications.

B) MATERIAL CHEMISTRY: Cement- Composition and manufacture of Port land Cement. Lubricants: Criteria of a good lubricant, classification. Refractory: Criteria of a good refractory, classification. Insulators & conductors: Classification of insulators. Characteristics of thermal & electrical insulators, Superconductors: Applications of Superconductors.

UNIT – IV **(7 Lectures)**

ENERGY SOURCES: Fuels: Classification -Conventional fuels: solid, liquid, gaseous fuels- comparison. Solid fuels: Coal- analysis- proximate and ultimate analysis, significance. Liquid fuels: Petroleum –origin, refining of petroleum. Synthetic petrol: Fischer Tropsch's and Bergius process. Gaseous fuels: Natural gas, Flue gas: Analysis of Flue gas by Orsat's method. Combustion: problems (calculation of amount and volume of oxygen for combustion).

UNIT – V **(7 Lectures)**

A) PHASE RULE: Gibb's phase rule expression, terms involved: Phase, Component and Degree of Freedom. Significance and limitations of phase rule. Phase diagrams: One component system- Water system. Two component system- Silver- lead system.

B) SURFACE CHEMISTRY: Adsorption: Types of adsorption. Adsorption isotherm: Langmuir adsorption isotherm, applications of adsorption. Colloid: Classification of colloids. Properties of colloid: Electrical & optical properties. Applications of colloids: Natural and industrial applications.

Nanomaterials: Introduction, preparation and applications of nanomaterial.

TEXT BOOKS:

1. S.S Dara & Mukkanti, (2006). Engineering Chemistry, S. Chand & Co. New Delhi.

REFERENCE BOOKS:

1. PC Jain & Monica Jain, (2008). Engineering Chemistry, Dhanpatrai Publishing Company.
2. K.N Mishra, R.P Mani &B. Rama Devi(2009). Chemistry of Engineering Materials, CENGAGE.
3. J.C Kuriacase & J Raja ram (2004), Engineering Chemistry, Tata McGraw Hills Co. New Del.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

ENGINEERING MECHANICS - I

Course Code: A3301

L	T	P	C
3	1	0	3

Course Overview:

Engineering Mechanics is the branch of science for analyzing force systems that acts upon the bodies at either at rest or in motion. The knowledge of mechanics helps us in designing the various parts of machine elements. The course content is designed in such a way that the balancing of various mechanical systems could be achieved by the calculations of center of gravity and moment of inertia. The effects of friction and the consequences of frictional forces on the mating parts will be analyzed to design various systems with negligible effort loss. The principle of virtual work helps us in designing the systems of having structural integrity.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Apply the laws of mechanics and evaluate the resultant force.

CO2. Construct free body diagrams and solve the problems using equations of equilibrium.

CO3. Analyze the frictional forces to maintain the equilibrium of system.

CO4. Identify the centroid and centre of gravity of a body by using principle of moments.

CO5. Determine the area moment of inertia and mass moment of inertia of a body.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

ENGINEERING MECHANICS – I

Course Code: A3301

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I **(10 Lectures)**

INTRODUCTION TO ENGINEERING MECHANICS: Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem - Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments - Concepts of force- components of forces in a plane and in space- various systems of forces and their resultants - moment of force and its applications - and couples.

UNIT-II **(10 Lectures)**

STATICS OF RIGID BODY: Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions.

UNIT – III **(8 Lectures)**

FRICTION: Types of Friction – Limiting Friction – Laws of Friction – Angle of repose- Equilibrium of body lying on rough inclined plane – Ladder friction – Wedge friction.

UNIT – IV **(10 Lectures)**

CENTROID: Introduction **-** Centroid – Centre of gravity-difference-use of symmetry-determination of centroid of simple and composite figures from basic principles. Theorems of Pappus – guldinus.

CENTER OF GRAVITY: Centre of gravity from basic principles–Centre of gravity of composite bodies.

UNIT – V **(10 Lectures)**

AREA MOMENTS OF INERTIA: Definition-Polar moments of inertia-Radius of gyration- Transfer theorems- Moment of inertia of regular and composite sections.

MASS MOMENTS OF INERTIA: Moment of inertia of masses- transfers formula and moment of inertia of standard and composite bodies.

TEXT BOOKS:

1. Fedinand L. Singer (1998)- *Engineering Mechanics*- Harper – Collins Publishers- New Delhi.
2. A. K. Tayal (2012)- *Engineering Mechanics*- Umesh Publications- New Delhi.

REFERENCES BOOKS:

1. Timoshenko & Young (2013)- *Engineering Mechanics*- Mc Graw Hill- India.
2. K. L Kumar (2009)- *Engineering Mechanics*- Tata Mc Graw Hill- New Delhi.
3. Irving. H. Shames (2004)- *Engineering Mechanics*- Prentice-Hall- India.
4. S. S. Bhavikatti- J. G. Rajasekharappa (2014)- *Engineering Mechanics*- New Age International- India.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

COMPUTER PROGRAMMING

Course Code: A3501

L	T	P	C
4	0	0	4

Course Overview:

The course is designed to provide a comprehensive study of the C programming language that covers the fundamental principles of computer programming, with an emphasis on problem solving strategies using structured programming techniques. The syntax and constructs of data types, control statements, arrays, functions and pointers are elaborated. The derived data types like structures, union and enumerations is also importantly discussed. The console I/O and file I/O systems are explained with the wide variety of examples and applications. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable and reusable code to solve mathematical, engineering and simple data processing problems.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Write algorithm and draw corresponding flowchart for simple problems besides explaining functions of computer components

CO2. Select the right identifiers, data types and operators for effective computation.

CO3. Write programs, demonstrating use of control statements, arrays and strings.

CO4. Demonstrate use of functions and pointers by writing programs.

CO5. Write programs for simple real life problems using structures and unions.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

COMPUTER PROGRAMMING

Course Code: A5001

L	T	P	C
4	0	0	4

SYLLABUS

UNIT – I **(15 Lectures)**

INTRODUCTION TO COMPUTERS: Computer systems, Computing environments, Computer languages, Creating and Running Programs, System Development - Algorithm, Pseudo Code, Flow Charting.

INTRODUCTION TO THE C LANGUAGE: Background, C Programs, Identifiers, Types, Variables, Constants, Formatted and Unformatted Console I/O Functions.

OPERATORS AND EXPRESSIONS: Arithmetic, Relational and Logical Operators, Assignment Operators**,** **I**ncrement and Decrement Operators, Conditional Operator, Bitwise Operators, Special Operators, Expressions, Precedence and Associativity, Side Effects, Type Conversion

UNIT – II **(14 Lectures)**

STATEMENTS: Null, Expression, Return, Compound, Selection, Iteration, Jump Statements.

ARRAYS: Using Arrays in C, Two-Dimensional Arrays, Multidimensional Arrays,

STRINGS: String Concepts, C Strings, String Input/Output Functions, Array of Strings, String Manipulation Functions.

UNIT – III **(12 Lectures)**

FUNCTIONS: User-Defined Functions, Inter-Function Communication, Standard Functions, Storage Classes, Recursion, Preprocessor Commands.

POINTERS: Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Array of Pointers, Pointers to Void and to Functions, Memory Allocation Functions, Command-Line Arguments.

UNIT – IV **(09 Lectures)**

STRUCTURES, UNIONS, ENUMERATIONS AND TYPEDEF: Structure Definition, Initialization, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Passing Structures through Pointers, Self-referential Structures, Unions, Bit-Fields, typedef, Enumerations.

UNIT – V **(08 Lectures)**

FILE I/O: Streams, Files, File Operations, File Opening Modes, Formatted File I/O Functions, Unformatted File I/O Functions, File Status Functions, File Positioning Functions.

TEXT BOOKS:

1. B. A. Fouruzan and R. F. Gilberg (2014), *C Programming & Data Structures,* 3rd Edition, CENGAGE Learning, India.

REFERENCE BOOKS:

1. Herbert Schildt (2013), *C: The Complete Reference*, 4th Edition, Mc Graw Hill Education (India) Pvt Ltd.
2. B. W. Kerninghan, Dennis M. Ritche (1988), *The C Programming Language*, 2nd edition, Prentice Hall Software Series, India.
3. Stephen G. Kochan (2014), *Programming in C*, 4th Edition, Addison-Wesley Professional.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

ENGINEERING PHYSICS AND ENGINEERING CHEMISTRY LAB

Course Code: A3007

L	T	P	C
0	0	3	2

ENGINEERING PHYSICS LAB

Course Overview:

Engineering physics laboratory course includes the experimental methods for the determination of mechanical property (Rigidity modulus of a given material), frequency of an AC signal, basic electronic circuits (LED, RC circuit), and to study characteristics of LASERS & Optical fiber (LASER wavelength, divergence, Numerical aperture of fiber, Losses in fibers). This interdisciplinary knowledge is designed for the continuous innovation occurring with technology.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Analyze the rigidity modulus of the given material to interpret the mechanical properties.

CO2. Estimate the frequency of AC power supply and time constant of a R-C circuit.

CO3. Apply the principles of optics to evaluate the characteristics of LED, laser and optical fibres.

ENGINEERING CHEMISTRY **LAB**

Course Overview:

Although engineers are not expected to carry out chemical analysis by themselves it is absolutely essential for them to have appreciation regarding the principles, applications, merits and limitations of the modern techniques of instrumental chemical analysis. The objective of few instrumental techniques, namely, pH metry, potentiometry, conductometry is to inculcate the knowledge of engineering chemistry discipline. The experiments on ion selective electrodes are proved to be vital in engineering applications on industrial level.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. To analyze the strength of a solution by conductometric and potentiometric titrations.

CO2. To estimate the hardness of water.

CO3. To determine the surface tension and viscosity of liquids.

CO4. To synthesize an organic compound-Aspirin.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

ENGINEERING PHYSICS AND ENGINEERING CHEMISTRY LAB

Course Code: A3007

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

LIST OF EXPERIMENTS (ENGINEERING PHYSICS LAB):

1. Determination of Rigidity modulus (η) of the material of the given wire using a Torsional pendulum.
2. Determination of Frequency (n) of an AC supply using sonometer.
3. Study of V-I characteristics of light emitting diode and determination of the Threshold voltage of LED.
4. Study of exponential decay of charge in a R.C. Circuit and determination of time constant of R.C circuit
5. Determination of numerical aperture of a given optical fiber.
6. Determination of wavelength of a given source of laser light using a plane transmission grating by normal incidence method.
7. Determination of angular divergence of the laser beam.
8. Determination of Losses in optical fibers.
9. Determination of Dispersive power of material of a prism (Demonstration Experiment).

LIST OF EXPERIMENTS (ENGINEERING CHEMISTRY LAB):

INSTRUMENTAL METHODS:

1. Conductometry:

a. Conductometric titration of strong acid Vs strong base.
b. Conductometric titration of mixture of acids Vs strong base.

2. Potentiometry:

a. Potentiometric titration of strong acid Vs strong base.
b. Potentiometric titration of weak acid Vs strong base.

3. Complexometry:

a. Estimation of hardness of water by EDTA method.

4. Physical Properties:

a. Determination of viscosity of sample oil by Ostwald's viscometer
b. Determination Surface Tension of lubricants.

5. Organic Synthesis:

a. Preparation of organic compounds Aspirin

DEMONSTRATION EXPERIMENTS

1. Preparation of Thiokol rubber

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

ENGINEERING DRAWING – I

Course Code: A3302

L	T	P	C
0	2	4	3

Course Overview:

This course is an introduction to the students about Engineering drawings that are usually created in accordance with standardized conventions for layout, nomenclature, interpretation, appearance (such as typefaces and line styles), size, etc. The drawing technique is emphasized on how to draw an object graphically and projection drawing from different point of view.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Construct various types of scales for the design of maps and models**.**

CO2. Represent the objects using various types of lines and dimensioning rules.

CO3. Make use of the knowledge of geometry and engineering curves for constructions.

CO4. Analyze the objects such as points, lines and regular planes held in different orientations using conventional drawing and CAD tools.

CO5. Visualize the solids held in different orientations using conventional drawings and CAD tools.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

ENGINEERING DRAWING – I

Course Code: A3302

L	T	P	C
0	2	4	3

LIST OF EXPERIMENTS

Note: 50 % Manual Practice and 50% CAD Practice UNIT - I

INTRODUCTION TO ENGINEERING DRAWING: Drawing instruments and accessories, types of line, lettering, rules of dimensioning, geometrical constructions, Construction of scales – Plain Scale, Diagonal Scale, Comparative Scale and Vernier Scale.

INTRODUCTION TO COMPUTER AIDED DRAFTING: CAD workstation, CAD Software, and CAD commands.

UNIT - II

CURVES USED IN ENGINEERING PRACTICE: Conic Sections – construction of ellipse, parabola and hyperbola; Cycloidal curves – cycloid, epicycloid and hypocycloid; involutes.

UNIT - III

ORTHOGRAPHIC PROJECTION: Principles of orthographic projections – conventions – first and third angle projections. Projection of points, projection of lines – lines inclined to single plane, lines inclined to both the planes, true lengths and traces.

UNIT – IV

PROJECTION OF PLANES: Projection of regular planes – planes inclined to one plane, planes inclined to both planes, projection of planes by auxiliary plain projection method.

UNIT – V

PROJECTION OF SOLIDS: Projections of regular solids – prisms, cylinders, pyramids, cones. Solids inclined to one plane, Solids inclined to both planes, projection of solid by auxiliary plain projection method.

TEXT BOOKS:

1. N. D. Bhatt (2012), *Engineering Drawing*, 49th Edition, Charotar Publications, New Delhi.
2. C M Agrawal, Basant Agrawal (2013) *Engineering Drawing*, 2th Edition, Tata Mc Graw Hill, India.

REFERENCE BOOKS:

1. Venugopal (2010), *Engineering Drawing and Graphics*, 2nd edition, New Age Publications, New Delhi.
2. Johle (2009), *Engineering Drawing*, Tata Mc Graw Hill, New Delhi, India.
3. Trymbaka Murthy (2007), *Computer Aided Engineering Drawing*, I.K. International Publishers, New Delhi.
4. R.B. Choudary (2005), *Engineering graphics with Auto CAD*, Anuradha Publishers, New Delhi

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

COMPUTER PROGRAMMING THROUGH C LAB

Course Code: A3502

L	T	P	C
0	0	3	2

Course Overview:

This hands-on course provides a comprehensive introduction to the ANSI C language, emphasizing portability and structured design. Students are introduced to all major language elements including data types, control statements and preprocessor directives. Thorough treatment is given to the topics of arrays, functions and pointers. The course elucidates the use of structures, unions, and enumerations. Emphasis is given to the processing of command line arguments and file systems, so as to write flexible, user-friendly programs. Comprehensive hands on exercises are integrated throughout to reinforce learning and develop real competency. It is used to program desktop applications, compilers, tools and utilities and even hardware devices.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Implement programs by selecting the right identifiers, data types and operators for effective computation.

CO2. Implement programs, demonstrating use of control statements, arrays and strings.

CO3. Implement programs, demonstrating use of functions and pointers.

CO4. Implement C programs for simple real life problems using structures and unions.

CO5. Implement programs illustrating use of files.

CO6. Debug erroneous programs related to the course.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME I Semester **VCE-R15**

COMPUTER PROGRAMMING THROUGH C LAB

Course Code: A3502

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

LIST OF EXPERIMENTS:

Week – 1 (Operators)

1. Write C programs for the following:

a) Swapping of two numbers without using a third variable.

b) Check whether the given number is odd or even using conditional operator.

c) Read two integers and shift the first integer by two bits to the left and second integer by one bit to the right.

Week – 2 (if and switch statements)

2. Write C programs for the following:

a) Check whether the input alphabet is a vowel or not.

b) Find the roots of a quadratic equation.

c) Which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week – 3 (Loops)

3. Write C programs for the following:

a) Print Armstrong numbers between 1 to n where n value is entered by the user. An Armstrong number is defined as the sum of the cubes of the individual digits of the given number. (e.g. 371 = 3^3 + 7^3 + 1^3)

b) Generate the first n terms of the Fibonacci sequence.

c) Calculate the following sum:

Sum=1 + $x^2/2!$ + $X^4/4!$ + ----------up to given 'n' terms.

Week – 4 (Loops)

4. Write C programs for the following:

a) Generate all the prime numbers between 1 and n, where n value is supplied by the user.

b) Print first n lines of the Pascal's Triangle. Pascal's Triangle is a triangular array of the binomial coefficients.

```
          1
        1   1
      1   2   1
    1   3   3   1
```

c) Print first n lines of Floyd's Triangle. 1

```
2  3
4  5  6
7  8  9  10
11 12 13 14 15
```

Week – 5 (Arrays)

5. Write C programs for the following:

a) Find the largest and smallest number among a list of integers.

b) Read a list of elements into an array 45, 14, 78, 36, 64, 9, 25, 99, 11 and find weather a particular element is present in the list or not using linear search.

c) Read two matrices and find the addition and multiplication of two matrices.

Week – 6 (Strings)

6. Write C programs for the following:

a) Check whether the given string is palindrome or not with and without using string functions.

b) Insert a sub-string in to given main string from a given position.

c) Count the number of lines, words and characters in a given string.

Week – 7 (Functions)

7. Write C programs that uses both recursive and non-recursive functions:

a) Find the factorial of a given number.

b) Find the N^{th} Fibonacci number.

c) Find the reverse of a number.

Week – 8 (Pointers)

8. Write C programs for the following:

a) Reverse a string using pointers.

b) Read a list of elements into an array. Find the sum of array elements using pointers.

c) Read an array of integers whose size will be specified interactively at rum time.

Week – 9 (Command line arguments)

9. Write C programs for the following:

a) Pass n number of arguments at the command line and display total number of arguments and their names.

b) Add two numbers using command line arguments.

Week – 10 (Structure and Union)

10. Write C programs for the following:

a) Read the full name and date of birth of a person and display the same using nested structure.

b) Create a Student structure containing name, roll No and grade as structure members. Display the name, rollNo and grade of n students by using array of structures concept.

c) Create a union named Item that contains, item Name, itemP rice and item Quantity as members and find the size of the union and number of bytes reserved for it.

Week – 11 (Enumerated Data Types, Typedef, Bit Fields, Pre-processor Directives)

11. Write C programs for the following:

a) Create enumerated data type for 7 days of a week. Display their values in integer constants.

b) Find the biggest number among two numbers using a parameterized macro.

c) Create a Student structure using typedef containing id, name and age as structure members. Declare a bit field of width 3 for age and display the student details.

Week – 12 (Files)

12. Write C programs for the following:

a) Copy the contents of one file to another.

b) Merge the contents of two files and store it in a third file.

c) Reverse the contents of a file.

Week – 13 (Additional Programs)

13. Write C programs for the following:

a) Read the student marks in five courses and based on the calculated average display the grade of the student.

b) Read two strings and compare these two strings character by character. Display the similar characters found in both the strings.

c) Read name and marks of N students' records from user and store them in a file.

REFERENCE BOOKS:

1. Yashawanth Kanethkar (2014), *Let us C*, 13th Edition, BPB Publications, India.
2. E. Balaguruswamy (2014), *Computer Programming,* 1st Edition, McGraw-Hill, India
3. Pradip Dey, Ghosh Manas (2009), *Programming in C,* Oxford University Press, USA.

SYLLABI FOR
II SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

MATHEMATICS – II

Course Code: A3006

L	T	P	C
4	1	0	4

Course Overview:

This course focus on basic areas of theory and more advanced Engineering Mathematics topics which provide students with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. Topics to be covered in this course include: solution for linear systems, Eigen values & Eigen vectors, linear transformations, partial differential equations, Fourier series, Fourier transforms & Z - transforms. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program.

Prerequisite(s):

- Mathematics – I (A3001)

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Solve** system of linear equations using rank of a matrix.

CO3. **Examine** the nature of the Quadratic form by eigen values and eigen vectors.3

CO3. **Classify** and solve Partial differential equations.

CO4. **Develop** Fourier series and Fourier transforms of a function.

CO5. **Apply** Z- Transforms to solve difference equations.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

MATHEMATICS - II

Course Code: A3006

L	T	P	C
4	1	0	4

SYLLABUS

UNIT – I **(11 Lectures)**

THEORY OF MATRICES: Real matrices: Symmetric, skew – symmetric and orthogonal matrices - Complex matrices: Hermitian, Skew - Hermitian and Unitary matrices - Elementary row and column transformations - Elementary matrix - Finding rank of a matrix by reducing to Echelon form and Normal form - Finding the inverse of a matrix using elementary row**/**column transformations (Gauss-Jordan method) - Consistency of system of linear equations (homogeneous and non- homogeneous) using the rank of a matrix - Solving $m \times n$ and $n \times n$ linear system of equations by Gauss elimination - Cayley-Hamilton Theorem (Statement and Verification) - Finding inverse and powers of a matrix by Cayley-Hamilton theorem.

UNIT – II **(12 Lectures)**

LINEAR TRANSFORMATIONS: Linear dependence and independence of vectors - Linear Transformation, Orthogonal Transformation - Eigen values and eigen vectors of a matrix – Properties of eigen values and eigen vectors of real and complex matrices - Diagonalization of a matrix. Quadratic forms up to three variables - Rank, Index, Signature and Nature of quadratic form - Reduction of a quadratic form to canonical form using linear and orthogonal transformations.

UNIT – III **(10 Lectures)**

PARTIAL DIFFERENTIAL EQUATIONS: Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions - Solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations - Equations reducible to standard forms - Method of separation of variables for second order equations.

UNIT – IV **(10 Lectures)**

FOURIER SERIES: Determination of Fourier coefficients - Fourier series in an arbitrary interval - Fourier series of even and odd functions - Half-range Fourier sine and cosine expansions.

UNIT – V **(13 Lectures)**

FOURIER TRANSFORMS & Z - TRANSFORMS: Fourier integral theorem (statement) - Fourier sine and cosine integrals - Fourier transforms - Fourier sine and cosine transforms - Properties - Inverse transforms - Finite Fourier transforms.

Z-transforms: Definition - Some standard Z-transforms - Damping rule - Shifting rule - Multiplication by n - Initial and final value theorems - Inverse Z-transforms using partial fractions - Convolution theorem - Solution of difference equations by Z - transforms.

TEXT BOOKS

1. B S Grewal (2012), *Higher Engineering Mathematics*, 42nd Edition, New Delhi, Khanna Publishers.
2. B V Ramana (2010), *Engineering Mathematics*, New Delhi, Tata Mc Graw Hill Publishing Co. Ltd

REFERENCE BOOKS

1. Ervin Kreyszig, *Advanced Engineering Mathematics,* 10th *Edition,* New Jersy, John *Wiley* & Sons
2. T K V Iyengar, B Krishna Gandhi & Others. (2011), *Mathematical Methods*, Tenth Revised Edition New Delhi, S.Chand & Co. Ltd.
3. H K Dass, Er Rajnish Varma (2012), *Higher Engineering Mathematics*, Second Revised Edition, New Delhi, S.Chand & Co. Ltd.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

TECHNICAL ENGLISH

Course Code: A3005

L	T	P	C
3	0	0	3

Course Overview:

The basic idea behind offering Technical English as a subject at the undergraduate level is to acquaint students with a language held by common consent to be the most popular language. The lessons included as part of syllabus, aim to take the nuances of English to students as it reveals its strengths and complexity when used to perform a variety of functions such as present technical seminars, prepare technical papers, abstracts, write effective business ,formal and job application letters , publish articles, etc. . For prospective engineers, nothing could be more useful or productive than being able to reach out to the world of technology and business through communication skills.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Develop an understanding of the significance of humanity, love and service to mankind and be involved in community service

CO2. Perceive the importance of technological impact on society and plan for the technological advancement

CO3. Apply the rules of Grammar effectively (articles, prepositions, concord, tenses etc.) in writing reports, technical articles, essays and in day- to-day conversations

CO4. Build creativity for career planning and entrepreneurship

CO5. Develop effective written communication skills in academic writing

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. MEII Semester **VCE-R15**

TECHNICAL ENGLISH

Course Code: A3005

L	T	P	C
3	0	0	3

SYLLABUS

UNIT – I **(8 Lectures)**

Chapter entitled ***Heaven's Gate*** From *Enjoying Everyday English* published by Orient Black Swan, Hyderabad.

Chapter entitled **Mother Teresa** from Inspiring speeches and lives Published by Maruthi Publication, Hyderabad.

Grammar **:** Articles – Prepositions

Vocabulary **:** Word formation with Prefixes and Suffixes – Synonyms and Antonyms –Homonyms, Homophones and Homographs – Idiomatic Expressions –Phrasal Verbs.

Writing **:** Paragraph Writing.

UNIT - II **(8 Lectures)**

Chapter entitled ***The Connoisseur*** From *Enjoying Everyday English* published by Orient Black Swan, Hyderabad.

Chapter entitled **Sam Pitroda** from Inspiring speeches and lives Published by Maruthi Publication, Hyderabad.

Grammar **:** Concord (Subject verb Agreement) - Adjectives and Degrees of Comparisons

Vocabulary **:** Word formation with Prefixes and Suffixes- Synonyms and Antonyms -Collocations- One word substitutes

Writing **:** Letter Writing: Types of letters, Styles of letters, Parts of letters, Letter of Apology and reply, Letter of Complaint and Reply.

UNIT - III **(8 Lectures)**

Chapter entitled ***The Odds Against Us*** From *Enjoying Everyday English* published by Orient Black Swan, Hyderabad.

Chapter entitled **I have a Dream** by Martin Luther King from Inspiring speeches and lives Published by Maruthi Publication, Hyderabad.

Grammar **:** Tenses, Question Tags

Vocabulary **:** Technical Vocabulary, Word formation with Prefixes and Suffixes- Synonyms and Antonyms Morphemes

Writing **:** Speech Writing, Dialogue and Speech Writing, Writing Technical Articles

UNIT - IV **(8 Lectures)**

Chapter entitled ***The Cuddalore Experience*** From *Enjoying Everyday English* published by Orient Black Swan, Hyderabad.

Grammar **:** Active and Passive Voice

Vocabulary **:** Synonyms and Antonyms, Words often confused / mis-spelt

Writing **:** Letter of Application and Preparation of Resume

UNIT - V **(10 Lectures)**

Chapter entitled ***Obama*** from *Inspiring speeches and lives* Published by Maruthi Publication, Hyderabad.

Grammar **:** Simple, Compound and Complex - Direct and Indirect Speech

Vocabulary **:** One word substitutes and Technical Vocabulary

Writing **:** Report Writing –Types of reports, importance of Reports, Styles of Reports, Structure of Reports–Writing informational, Progress Reports and Analytical Reports in Technical Contexts.

TEXT BOOKS

1. Ramakrishna Rao. A (2009). *Enjoying Every day English*. Hyderabad: Sangam Books.
2. Yadava Raju. B. & Muralikrishna .C (2009). *Inspiring Speeches and Lives.* Guntur: Maruthi Publications.
3. Meenakshi Raman & Sangeeta Sharma, (2009). *Technical Communication.* Oxford University Press.

REFERENCES

1. Ashraf Rizvi M, (2005). *Effective Technical Communication*. New Delhi: Tata Mc Graw Hill.
2. Raymond Murphy, (2004). *Murphy's English Grammar with CD.* 3rd edition. Cambridge University Press.
3. Wren & Martin (1936), revised by N.D.V.Prasad Rao(1999).English Grammar and Composition. S. Chand Publications
4. Mario Rinvolucri &Paul Davis(2005) More Grammar Games. Cambridge University Press.
5. Edgar Thorpe & Showick Thorpe., (2008). *Basic Vocabulary for Competitive Examination.* Pearson Education.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

PROBABILITY THEORY AND NUMERICAL METHODS

Course Code: A3004

L	T	P	C
3	1	0	3

Course Overview:

This course is a study of probability theory and numerical techniques used to model engineering systems. Topics in probability include: basic axioms of probability, Baye's Theorem, random variables, discrete and continuous probability distributions. It involves the development of mathematical models and the application of the computer to solve engineering problems using the following computational techniques: root-finding using bracketing and open methods, Interpolation, numerical differentiation, numerical integration, linear and polynomial curve fitting and the solution of differential equations using single step methods and multi-step methods.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Solve real world problems using the theory of probability.

CO2. Identify the types of random variables involved in a given problem and calculate relevant probabilities.

CO3. Develop appropriate Numerical methods to approximate a function.

CO4. Make use of Numerical differentiation and integration in solving problems of engineering.

CO5. Apply appropriate method to find numerical solution of a differential equation.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

PROBABILITY THEORY AND NUMERICAL METHODS

Course Code: A3004

L	T	P	C
3	1	0	3

SYLLABUS

UNIT-I

PROBABILITY **(8 Lectures)**

Sample space and events, probability- axioms of probability-some Elementary theorems-conditional probability-Bayes Theorem.

UNIT-II **(8 Lectures)**

RANDOM VARIABLES &DISTRIBUTIONS

Random variables. Discrete distribution – continuous distribution. Binomial distribution - Poisson distribution –Normal distribution-Related properties. Normal Approximation to binomial distribution

UNIT-III **(12 Lectures)**

ALGEBRAIC AND TRANSCENDENTAL EQUATIONS, INTERPOLATION:

Bisection method - Regula-falsi method - Iteration method – Newton - Raphson method.

Interpolation: Finite differences: Forward, Backward and Central differences - Other difference operators and relations between them - Differences of a polynomial – Missing terms - Newton's forward interpolation, Newton's backward interpolation, Interpolation with unequal intervals – Lagrange's interpolation.

UNIT-IV **(8 Lectures)**

NUMERICAL DIFFERENTIATION, INTEGRATION AND CURVE FITTING: Numerical differentiation: Derivatives using Newton's interpolation formulae. Numerical integration: Newton-cotes quadrature formula - Trapezoidal rule - Simpson's one-third rule - Simpson's three-eighth rule.

Curve Fitting: Method of least squares - Fitting a straight line, second degree parabola and non-linear curves of the form by the method of least squares.

UNIT-V **(8 Lectures)**

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS: Single step methods: Taylor's series method - Euler's and modified Euler's Methods - Fourth order Runge-Kutta method for solving first order equations – Multistep method: Adam's bash forth Predictor and Corrector method.

TEXT BOOKS

1. B S Grewal, (2012), *Higher Engineering Mathematics*, 42nd Edition, New Delhi, Khanna Publishers.
2. Richard Arnold Johnson, Irwin Miller, John E. Freund,(2011), *Probability and Statistics for Engineers*, Eighth Edition, New Delhi, Prentice Hall

REFERENCE BOOKS

1. G S S Bhishma Rao (2011), *Probability and Statistics*, Fifth Edition, Hyderabad, Scitech Publications Pvt. Ltd.
2. N P Bali and N Ch Narayana Iyengar , (2004), *A Textbook of Engineering Mathematics*, Sixth Edition, New Delhi, Laxmi Publications.
3. S S Sastry, (2005), *Introductory Methods of Numerical Analysis*, Fourth Edition, New Delhi, PHI Learning Pvt.Ltd.
4. Iyengar T.K.V., Krishna Gandhi B. & Others., (2013), Numerical Methods, Second Revised Edition, New Delhi, S. Chand & Co. Ltd.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

BASIC ELECTRONICS

Course Code: A3402

L	T	P	C
3	1	0	3

Course Overview:

This course covers fundamental topics that are common to a wide variety of analog and digital electronics. This course starts with basics of semiconductors, review the operation and characteristics of semiconductor devices (namely, semiconductor diodes and BJTs), and buildup to more advanced topics in analog circuit designs. This course also focuses on the fundamentals of number systems, Boolean algebra and logic gates. This course enables the students to have exposure in inter-disciplinary concepts.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Analyze the physical behavior of diodes and transistors.

CO2. Compare various rectifiers, filters, transistors, biasing circuits and transistor amplifier configurations.

CO3. Analyze single stage amplifier circuits using small signal low frequency transistor model.

CO4. Distinguish between the concepts of negative and positive feedback in amplifiers and analyze various feedback amplifiers and oscillator circuits.

CO5. Apply the knowledge of number systems and Boolean algebra in minimizing Boolean functions and realizing logic gates.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. MEII Semester **VCE-R15**

BASIC ELECTRONICS

Course Code: A3402

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I **(10 Lectures)**

DIODE AND ITS CHARACTERISTICS: P-N junction diode, operation in forward and reverse bias conditions, V-I characteristics, Zener diode and its characteristics, rectifiers - half wave, full wave and bridge rectifiers (simple problems), Filters(qualitative treatment), voltage regulation using Zener diode.

UNIT - II **(12 Lectures)**

TRANSISTORS: Bipolar Junction Transistor (BJT) - construction, operation, CE, CB and CC transistor configurations and characteristics.

BJT BIASING: Need for biasing, operating point, load line analysis, biasing and stabilization techniques: fixed bias, collector to base bias, self-bias.

UNIT – III **(12 Lectures)**

BJT AMPLIFIERS: Transistor as an amplifier, BJT h-parameter model, analysis of transistor amplifier using h- parameter model, CE, CB and CC amplifiers, comparison of CB, CE and CC configurations, Simplified h-parameter model.

UNIT – IV **(12 Lectures)**

FEEDBACK AMPLIFIERS: Concept of feedback, classification of feedback amplifiers, general characteristics of negative feedback amplifiers, effect of negative feedback on input and output resistances.

OSCILLATORS: Condition for oscillations, RC Phase shift oscillator with transistor, Wein bridge oscillator, Hartley and Colpitts oscillator.

UNIT – V **(12 Lectures)**

DIGITAL SYSTEMS AND BINARY NUMBERS: Digital systems, binary numbers, number base conversions, octal, hexadecimal numbers and complements.

BOOLEAN ALGEBRA AND LOGIC GATES: Basic definitions, axiomatic definition of Boolean algebra, basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, digital logic gates.

TEXT BOOKS:

1. Jacob Milliman, Christos C .Halkias, Satyabrata Jit (2011), *Electronic Devices and Circuits*, 3rd edition, Tata McGraw Hill, New Delhi.
2. M. Morris Mano, Michael D. Ciletti (2008), *Digital Design*, 4th Edition, Pearson Education Inc, India.

REFERENCE BOOKS:

1. G. K. Mittal (1999), *Electronic Devices and Circuits*, 22nd edition, Khanna Publications, New Delhi.
2. S. Shalivahanan, N. Suresh Kumar, A. Vallavaraj (2007), *Electronic Devices and Circuits*, 3rd edition, McGraw Hill, New Delhi, India.
3. Zvi. Kohavi (2004), *Switching and Finite Automata Theory*, Tata McGraw Hill, India.
4. C. V. S. Rao (2009), *Switching and Logic Design*, 3rd Edition, Pearson Education, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

ENGINEERING MECHANICS – II

Course Code: A3303

L	T	P	C
4	1	0	4

Course Overview:

This is second course in Engineering Mechanics - which is the study of the interaction of matter and forces in engineering contexts. It is evident that all objects in the world around us are composed of matter and they are all subject to forces. As such- Engineering Mechanics is a foundational tool for engineers and forms the underlying basis for understanding more advanced fields such as Solid Mechanics - Fluid Dynamics - Rigid Body Dynamics – Aerodynamics – Structures - and Control.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Use the basic concepts of kinematics, laws to solve engineering problems.

CO2. Analyze rectilinear and curvilinear motion of particles and rigid bodies.

CO3. Solve the dynamics problems by using work-energy principle.

CO4. Apply the Impulse-momentum principles and solve the problems.

CO5. Determine the natural frequency of the system using simple harmonic motion principles.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

ENGINEERING MECHANICS - II

Course Code: A3303

L	T	P	C
4	1	0	4

SYLLABUS

UNIT - I **(12 Lectures)**

KINEMATICS: Rectilinear motion- curvilinear motion- velocity and acceleration- types of rigid body motion- and analysis in a plane.

PROJECTILES: Definitions-Motion of body projected horizontally-projection on inclined plane-inclined projection on level ground-problems.

UNIT - II **(12 Lectures)**

KINETICS: Analysis as a particle- and analysis as a rigid body in translation- kinetics of rotating bodies about fixed axis - central force motion - Equations of planar motion - D' Alembert's principle – Moment of momentum –applications.

UNIT - III **(12 Lectures)**

WORK AND ENERGY: Work done by a Force and a System of Forces - Work done by a Varying force - Energy - Potential Energy - kinetic Energy of a Particle - Kinetic Energy of a Rigid Body in Rotation and in Plane motion - Work and Energy Principle - Law of Conservation of Energy.

UNIT – IV **(12 Lectures)**

IMPULSE AND MOMENTUM: Introduction to momentum – impulse - Principle of Linear Impulse and Linear Momentum- Conservation of Linear Momentum- Direct central Impact- Coefficient of Restitution- Angular momentum.

UNIT - V **(10 Lectures)**

MECHANICAL VIBRATIONS: Definitions- Concepts – Simple Harmonic Motion – Damped and Un-damped Free vibrations - Simple and Compound pendulums and its applications.

TEXT BOOKS:

1. Fedinand L. Singer (1998)- *Engineering Mechanics*- Harper – Collins Publishers- New Delhi.
2. K. Tayal (2012)- *Engineering Mechanics*- Umesh Publications- New Delhi.

REFERENCE BOOKS:

1. Timoshenko & Young (2013) - *Engineering Mechanics*- Mc Graw Hill- India.
2. K. L Kumar (2009) - *Engineering Mechanics*- Tata Mc Graw Hill- New Delhi.
3. Irving. H. Shames (2004) - *Engineering Mechanics*- Prentice-Hall- India.
4. S. S. Bhavikatti- J. G. Rajasekharappa (2014)- *Engineering Mechanics*- New Age International- India.
5. G. K. Grover- (2009) - *Mechanical Vibrations*- Nem Chand & Brothers- India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Course Code: A3008

L	T	P	C
0	0	3	2

Course Overview:

The basic idea behind offering English as a practical subject at the undergraduate level is to acquaint the students with a language that enjoys currently as a lingua franca of the globe. In the ELCS lab the students are trained in Communicative English Skills: phonetics, word accent, word stress, rhythm and intonation, making effective oral presentations- both extempore and Prepared- seminars, group discussions, presenting techniques of writing, role play, telephonic skills, asking and giving directions, information transfer, debates, description of person, place, objects etc. The lab encourages students to work in a group, engage in peer-reviews and inculcate team spirit through various exercises on grammar, vocabulary, listening and pronunciation games, etc.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Improve their pronunciation using the rules of Phonetics.

CO2. Take part in role-plays and interviews to perform effectively in real life situations.

CO3. Choose appropriate words and phrases to make the telephonic conversation conveying the meaning with etiquettes.

CO4. Minimize the stage fear and make presentations with proper body language.

CO5. Adapt the art of debating and group discussion to present their view point convincingly.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Course Code: A3008

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

The following course content is prescribed for the **English Language Communication Skills Lab**

Exercise – I
CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants
ICS Lab: Ice-Breaking activity and JAM session Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms

Exercise – II
CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.
ICS Lab: Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette - Concord (Subject in agreement with verb) and Words often mis-spelt-confused/misused.

Exercise - III
CALL Lab: Minimal Pairs- Word accent and Stress Shifts- Listening Comprehension.
ICS Lab: Descriptions- Narrations- Giving Directions and guidelines - Sequence of Tenses, Question Tags and One word substitutes.

Exercise – IV
CALL Lab: Intonation and Common errors in Pronunciation.
ICS Lab: Extempore- Public Speaking Active and Passive Voice – Common Errors in English, Idioms and Phrases

Exercise – V
CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice
ICS Lab: Information Transfer- Oral Presentation Skills - Reading Comprehension and Job Application with Resume preparation.

Suggested Software:

- Cambridge advanced learners' English dictionary with CD.
- The Rosetta stone English library.
- Clarity pronunciation power –part I.
- Oxford advanced learner's compass, 7th Edition.
- Learning to speak English -4 CDs.
- Vocabulary in use, Michael McCarthy, felicity o'den, Cambridge.
- Murphy's English grammar, Cambridge with CD.

REFERENCE BOOKS:

1. Suresh Kumar. E. & Sreehari P.A (2007), Handbook for English Language Laboratories,
2. Cambridge University Press India Pvt. Ltd, New Delhi.
3. Mandal S. K (2006), Effective Communication & Public Speaking, Jaico Publishing House, New Delhi.
4. Grant Taylor (2004), English Conversation Practice, Tata McGraw Hill, New Delhi.
5. Balasubramanian .T (2000), A text book of English Phonetics for Indian Student, MacMillan Publishers, India.
6. Kamalesh Sadanand, Susheela Punitha (2008), Spoken English: A foundation Course: Parts 1 & 2, New Delhi, Orient Longman Pvt. Ltd

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

ENGINEERING DRAWING - II

Course Code: A3304

L	T	P	C
0	2	4	3

Course Overview:

This course is an introduction to the students about Engineering drawings that are usually created in accordance with standardized conventions for layout, nomenclature, interpretation, appearance (such as typefaces and line styles), size, etc. The drawing technique is emphasized on how to draw an object graphically and projection drawing from different point of view.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Develop the lateral surface of regular solids.

CO2. Imagine the sectional views and curves of intersections of regular solids.

CO3. Analyze isometric projections of objects such as regular planes and solids using conventional drawing and CAD tools.

CO4. Convert isometric views to orthographic views & vice versa.

CO5. Visualize the perspective projections of regular planes and solids using conventional drawing and CAD tools.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

ENGINEERING DRAWING – II

Course Code: A3304

L	T	P	C
0	2	4	3

LIST OF EXPERIMENTS

Note: 50 % Manual Practice and 50% CAD Practice

UNIT - I

SECTIONS OF SOLIDS: Sections of prisms, pyramids, cylinders and cones**.**

DEVELOPMENT OF SURFACES: Development of lateral surface of right regular solids – prisms, cylinders, pyramids and cones.

UNIT - II

INTERSECTION OF SOLIDS: Intersection of two cylinders, cylinder and prism, cylinder and cone, prism and prism.

UNIT – III

ISOMETRIC PROJECTIONS: Principle of isometric projection, isometric scale, isometric projections and isometric views, Isometric projections of planes, prisms, cylinders, pyramids, and cones.

UNIT - IV

TRANSFORMATION OF PROJECTIONS: Conversion of isometric views to orthographic views and conversion of orthographic views to isometric views.

UNIT - V

PERSPECTIVE PROJECTIONS: Concept of perspective projection, Terminology in perspective projection, methods of perspective projection – Vanishing Point method, Visual Ray method.

TEXT BOOKS:

1. N. D. Bhatt, V. M. Panchal (2012), *Engineering Drawing***,** 49th Edition, Charotar Publishing House, Gujarat.
2. C M Agrawal, Basant Agrawal (2013) *Engineering Drawing*, 2nd Edition, Tata Mc Graw Hill, India.

REFERENCE BOOKS:

1. D. M. Kulkarni, A. P. Rastogi, and A. K. Sarkar (2009), *Engineering Graphics with AutoCAD*, PHI Learning Private Limited, New Delhi.
2. Arshad Noor Siddiquee, Zahid Akhtar Khan, Mukhtar Ahmad (2006), *Engineering Drawing with a Primer on AutoCAD,* 2nd Edition, Prentice Hall, India.
3. Jolhe, Dhananjay (2006), *Engineering Drawing: With an Introduction to CAD*, Tata Mc Graw Hill, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

ENGINEERING WORKSHOP

Course Code: A3305

L	T	P	C
0	0	3	2

Course Overview:

This course provides comprehensive knowledge of the various trades and tools used in an Engineering workshop. It emphasizes on the use of various workshop tools with safety aspects. The essence of this lab is also to make the students know about identifying hardware devices in PC, hardware assembling and disassembling, and internet capabilities and understand the usage different software's like MS Office.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Identify the tools and equipment utilized in workshop.

CO2. Choose the required trade for the suitable operations.

CO3. Make the Wooden joints, MS fittings, house wiring, sheet metal components and simple forgings.

CO4. Explain the working of Arc Welding and Plumbing operations, uses of power tools and installation of Software in the computer systems.

CO5. Prepare the documents, data sheets and power point slides by using the Microsoft office tools.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME II Semester **VCE-R15**

ENGINEERING WORKSHOP

Course Code: A3305

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

PART – A

TRADES FOR PRACTICE:

Note: Minimum two exercises have to be practiced in each of the following trades

a. Carpentry
b. Fitting
c. Tin-Smithy
d. Foundry
e. Black-Smithy
f. House Wiring

PART-B

TRADES FOR DEMONSTRATION:

a. Arc-Welding
b. Plumbing
c. Power Tools

PART-C

Note: At least two tasks have to be carried out from the following tasks

Task 1

Introduction to Computer: block diagram of the CPU along with the configuration of each peripheral component and its functions. Practice to disassemble and assemble the components of a PC to working condition.

Task 2

Installation of operating systems: like MS Windows, Linux and different packages on a PC. Diagnosis of PC malfunction, types of faults, common issues and how to fix them. Basic hardware & software troubleshooting steps, PC diagnostic tools.

Task 3

Introduction to Network: types of Networks, types of network topologies, types of network protocols, drivers loading and configuration settings, mapping of IP addresses, configuration of internet and Wi-Fi , bookmarks, search toolbars and pop up blockers.

Task 4

Introduction to Search Engines and Cyber Hygiene: types of search engines and how to use search engines, awareness of various threats on internet, types of attacks and how to overcome. Installation of antivirus software, configuration of personal firewall and windows update on computers.

Task 5

Introduction to Word: importance of word as word processor, overview of toolbars, Saving, accessing files, using help and resources.

Creating project Certificate: Abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check ,

Track

Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Creating Time Table: Abstract Features to be covered:-Formatting Styles, Inserting table.

Task 6

Introduction to Power Point: Utilities, Overview of toolbars, PPT Orientation, slide layouts, Types of views.

Creating Front page of The presentation: Create a power point presentation using the features - slide layouts, inserting text, word art, formatting text, bullets and numbering, auto shapes, lines and arrows, hyperlinks, inserting –images, clip art, audio, video, objects, tables and charts

Task 7

Introduction to Excel: Overview of toolbars, accessing, Saving excel files, Using help and resources. Create a excel using the features - gridlines, format cells, summation, auto fill, formatting text, cell referencing, formulae in excel – average, standard deviation, charts, renaming and inserting worksheets, hyper linking, count function, sorting, conditional formatting.

Creating a Scheduler: Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 8

Introduction to latex: importance of LaTeX, Details of LaTeX word accessing, overview of toolbars, saving files and using help and resources, features to be covered in LaTeX word and LaTeX power point.

Creating project Certificate: Abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

TEXT BOOKS:

1. H. S. Bawa (2007), Workshop Practice, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. B. Rajendra Prasad & P. M. M. S. Sarma (2002), Workshop Practice, SreeSai Publication, New Delhi.

REFERENCE BOOKS:

1. K. Jeyachandran, S. Natarajan, S. Balasubramanian (2007), A Primer on Engineering Practices Laboratory, Anuradha Publications, New Delhi.
2. T. Jeyapoovan, M. Saravanapandian, S. Pranitha (2006), Engineering Practices Lab Manual, Vikas Publishing House Private Limited, New Delhi
3. Workshop Technology, Part 1, W.A.J. Chapman, Viva Low Priced Student Edition.
4. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
5. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken.
6. Quamme. – CISCO Press, Pearson Education.
7. PC Hardware and A+ Handbook – Kate J. Chase PHI (Microsoft)

SYLLABI FOR
III SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

MECHANICS OF SOLIDS

Course Code: A3307

L	T	P	C
3	1	0	3

Course Overview:

Mechanics of solids is that branch of engineering Science, which plays a critical role in determining the behavior of materials by applications of mechanical loads and there by design of various components to meet the modern engineering applications. This course emphasizes on the concepts of stress, strain and deformation applied to bars, beams, columns and cylinders etc.

Prerequisite(s):

- Engineering Mechanics-I (A3301)

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the basics of material properties, concepts of stress-strain relationships for homogenous, isotropic materials.

CO2. Design and analyze structural members and machine parts under axial load, shear load, bending moment and torsional moment.

CO3. Determine the deflections and deformations of loaded flexural members.

CO4. Calculate stresses and strains associated with thin-wall spherical and cylindrical pressure vessels.

CO5. Build the necessary theoretical background for further structural analysis and design courses.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

MECHANICS OF SOLIDS

Course Code: A3307

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I **(12 Lectures)**

SIMPLE STRESSES AND STRAINS: Elasticity and plasticity, Types of stresses and strains, Hooke's law, stress strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio and volumetric strain, Elastic module and the relationship between them, Bars of varying section, composite bars, Temperature stresses. Strain energy, Resilience - Gradual, Sudden, Impact and Shock loadings.

UNIT – II **(10 Lectures)**

SHEAR FORCE AND BENDING MOMENT: Definition of beam, Types of beams, Concept of shear force and bending moment, Relation between Shear Force and Bending Moment, and rate of loading at a section of a beam. Shear Force and Bending Moment diagrams for cantilever simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads.

UNIT – III **(12 Lectures)**

FLEXURAL STRESSES: Theory of simple bending, Assumptions, Derivation of bending equation, Neutral axis, Determination bending stresses, section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections.

SHEAR STRESSES: Derivation of formula, Shear stress distribution across various beams sections like rectangular, circular, I, T, angle and channel sections.

UNIT – IV **(10 Lectures)**

DEFLECTION OF BEAMS: Bending into a circular arc slope, deflection and radius of curvature, Differential equation for the elastic line of a beam, Double integration and Macaulay's methods, Determination of slope and deflection for cantilever and simply supported beams subjected to point loads.

UNIT – V **(10 Lectures)**

THIN AND THICK CYLINDERS: Thin seamless cylindrical shells, Derivation of formula for longitudinal and circumferential stresses hoop, longitudinal and volumetric strains, changes in diameter, and volume of thin cylinders, Riveted boiler shells, Thin spherical shells. A thick cylinder lame's equation, cylinders subjected to inside and outside pressures, compound cylinders.

TEXT BOOKS:

1. Ramamrutham. S (2012), Strength *of materials*, 17th edition, Dhanpat Rai Publications, New Delhi, India.
2. Timoshenko. S (2004), *Strength of materials*, 3rd edition, CBS Publishers, New Delhi, India.

REFERENCE BOOKS:

1. Ryder G. H (2007), *Strength of materials*, 3rd edition, Macmillan, New Delhi, India.
2. Bhavikathi S. S (2008), *Strength of materials*, 3rd edition, Vikas Publishing House, New Delhi, India.
3. Dr. Bansal R. K (2007), Strength of materials, 10th edition, Laxmi Publications, Hyderabad, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

MECHANICS OF FLUIDS

Course Code: A3308

L	T	P	C
3	1	0	3

Course Overview:

This course starts by introducing some basic ideas of application of fluid mechanics in day to day life. The course provides detailed study of fluid properties, fluids types, fluid dynamics, energy and momentum principles and flow measurement. The course of fluid mechanics includes the derivation of continuity, Bernoulli and Euler equations and their applications, boundary layer concepts and study of compressible fluids.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the fundamental aspects of fluid statics, kinematics and dynamics.

CO2. Compare types of fluids, fluid flows, pressure and flow measuring devices, losses in pipes, laminar and turbulent boundary layer concepts.

CO3. Solve problems by applying the principles of mass, momentum and energy conservation.

CO4. Analyze flow through pipes and pipe fittings, nozzles, drag and lift on submerged bodies, propagation of pressure waves.

CO5. Determine the specifications of pressure and flow measuring devices, piping, nozzles and submerged bodies.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

MECHANICS OF FLUIDS

Course Code: A3308

L	T	P	C
3	1	0	3

SYLLABUS

UNIT - I **(10 Lectures)**

FLUID PROPERTIES AND FLUID STATICS: Density, Mass density, Specific weight, Specific volume, Specific gravity, viscosity, Vapour pressure, compressibility, Surface tension, Pascal's law, Hydro static law, Piezometer, Simple and differential manometers, pressure gauges.

UNIT - II **(10 Lectures)**

FLUID KINEMATICS: Types of flows, steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows, Compressible and Incompressible flows. One, two and three dimensional flows, Continuity equation in 3D flow, Stream line, path line, streak line, stream tube, stream function, velocity potential function, Free and Forced Vortex.

UNIT – III **(10 Lectures)**

FLUID DYNAMICS: Surface and Body forces, Euler's and Bernoulli's equation derivation, Momentum equation and applications.

FLOW MEASUREMENT: Flow through Venturimeter, Orifice meter and Pitot tube, flow through nozzles, Darcy's equation, Major and Minor losses, pipes in series, pipes in parallel, total energy line and hydraulic gradient line.

UNIT – IV **(10 Lectures)**

BOUNDARY LAYER CONCEPTS: Definition, Displacement thickness, Momentum thickness and Energy Thickness, Boundary layer characteristics along thin plate, laminar and turbulent layers, boundary layer in transition flow, separation of boundary layer, drag and lift on submerged bodies.

UNIT - V **(10 Lectures)**

FLOW OF COMPRESSIBLE FLUID: Introduction, Thermodynamic relations, basic equations of compressible flow, Velocity of sound wave in a fluid for isothermal and adiabatic process, Mach number and its applications, Mach angle, propagation of pressure waves and stagnation properties.

TEXT BOOKS:

1. P. N. Modi, S. M. Seth (2011), *Hydraulics and fluid mechanics including hydraulic machines***,** 18th revised edition Standard Book House, India.
2. Yumus A. Cengel, John M. Cimbala (2010), *Fluid Mechanics (SI Units),* 2nd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. R. K. Bansal (2011), *A Textbook of Fluid Mechanics and Hydraulic Machines*, 10th edition, Laxmi Publications, New Delhi, India.
2. Frank M. White (2011), *Fluid Mechanics*, 7th edition, Tata McGraw Hill, New Delhi, India.
3. John F. Dauglas (2005), Fluid *Mechanics*, 5th edition, Pearson Education Limited, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

THERMODYNAMICS

Course Code: A3309

L	T	P	C
4	0	0	4

Course Overview:

Thermodynamics is the field of physics that deals with the relationship between heat and work in a substance during different types of thermodynamic processes. Specifically, thermodynamics focuses largely on how a heat transfer is related to various energy changes within a system undergoing a thermodynamic process. Such processes usually result in work being done by the system and are guided by the laws of thermodynamics. The course is extended to study the properties of pure substance and also the analysis of power and refrigeration cycles.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the properties and basic concepts of thermodynamics.

CO2. Develop the general energy equations for thermal systems by laws of thermodynamics.

CO3. Solve heat and work transfer for different thermodynamic processes.

CO4. Evaluate the performance of power cycles and refrigeration cycles.

CO5. Determine the properties of pure substance in various regions using steam tables.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

THERMODYNAMICS

Course Code: A3309

L	T	P	C
4	0	0	4

SYLLABUS

UNIT – I **(12 Lectures)**

BASIC CONCEPTS: Macroscopic and microscopic approaches, thermodynamic systems, boundary, surroundings, thermodynamic property, intensive and extensive properties, concept of continuum, thermodynamic equilibrium, state, path, process and cycle, quasi static, reversible and irreversible processes, Energy and its forms, concepts of heat and work, equality of temperature and Zeroth Law of thermodynamics, thermodynamic temperature scales.

UNIT – II **(10 Lectures)**

FIRST LAW OF THERMODYNAMICS: First law of thermodynamics, internal energy, enthalpy, PMM-I, Steady flow energy equation, Application of First law to non-flow and steady flow processes, Throttling and free expansion processes, Limitations of first law of thermodynamics.

UNIT – III **(12 Lectures)**

SECOND LAW OF THERMODYNAMICS: Kelvin-Planck and Clausius statements, heat engine, heat pump, refrigerator, PMM-II, Carnot cycle, Carnot heat engine, Carnot theorem and its corollaries, Entropy, Clausius inequality, principle of entropy increase. Availability, unavailable energy, Helmholtz function, Gibbs function and Maxwell's relations.

UNIT – IV **(12 Lectures)**

PURE SUBSTANCE: Properties of pure substance, phase transformation, saturated and superheated steam, solid-liquid-vapour equilibrium, Formation of steam, dryness fraction, properties of dry, wet and superheated steam, Mollier diagram and steam calorimetry.

UNIT – V **(10 Lectures)**

POWER CYCLES: Air standard cycles - Otto, Diesel and Dual combustion cycles, description and representation on PV and TS diagrams, Thermal efficiency, mean effective pressures on air standard basis, comparison of cycles. Introduction to Rankine and Bell-Coleman Cycles.

TEXT BOOKS:

1. P. K. Nag (2008), Engineering Thermodynamics, 3rd edition, Tata McGraw-Hill, New Delhi, India.
2. R. K. Rajput (2010), A text book of Engineering Thermodynamics, Fourth Edition, Laxmi Publications, New Delhi, India

REFERENCE BOOKS:

1. J. B. Jones, R. E. Dugan (2009), Engineering Thermodynamics, 1st edition, Prentice Hall of India Learning, New Delhi, India.
2. Yunus Cengel, Boles (2011), Thermodynamics - An Engineering Approach, 7th edition, Tata McGraw-Hill, New Delhi, India.
3. Y. V. C. Rao (2009), An introduction to Thermodynamics, Revised Edition, Universities Press, Hyderabad, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

METALLURGY AND MATERIAL SCIENCE

Course Code: A3310

L	T	P	C
3	1	0	3

Course Overview:

Metallurgy is a domain of materials science and engineering that studies the physical and chemical behavior of metallic elements, their intermetallic compounds, and their mixtures, which are called alloys. Metallurgy is also the technology of metals: the way in which science is applied to the production of metals, and the engineering of metal components for use in products for consumers and manufacturers. The production of metals involves the processing of ores to extract the metal they contain, and the mixture of metals, sometimes with other elements, to produce alloys.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the basic principles of materials.

CO2. Identify the phases and interrelationship between structure and properties.

CO3. Construct phase diagram of alloy systems.

CO4. Apply basic principles for selection of materials.

CO5. Characterize materials based on structure.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

METALLURGY AND MATERIAL SCIENCE

Course Code: A3310

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I **(10 Lectures)**

INTRODUCTION: Historical perspective, scope of materials science and engineering. Atomic structure and inter atomic bonding and metallurgical tools

STRUCTURE OF METALS: Lattices, basic idea of symmetry. Bravais lattices, unit cells, crystal structures, crystal planes and directions, co-ordination number. Imperfections in solids: point defects, line defects, surface defects. Grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys, determination of grain size.

CONSTITUTION OF ALLOYS: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds; Working and annealing of metal and its alloys.

UNIT - II **(10 Lectures)**

EQUILIBRIUM OF DIAGRAMS: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of Fe-Fe3C, equilibrium phase diagram.

UNIT - III **(10 Lectures)**

CAST IRONS AND STEELS: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

HEAT TREATMENT OF ALLOYS: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT - IV **(10 Lectures)**

NON-FERROUS METALS AND ALLOYS: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

ADVANCED AND SPECIAL PURPOSE ALLOYS: High temperature alloys, special steels and alloys for Aero-space, Missile and Strategic applications.

UNIT - V **(10 Lectures)**

CERAMIC MATERIALS: Crystalline ceramics, glasses, cermets, abrasive materials, nanomaterials - definition, properties and applications of the above.

COMPOSITE MATERIALS: Classification of composites, methods of manufacturing of composites, particle - reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal matrix composites and C – C composites.

TEXT BOOKS:

1. V. Raghavan , *Material Science and Engineering: A first course*, 5th edition, Prentice Hall of India (P) Ltd, New Delhi, India.
2. Sidney H. Avener , *Introduction to Physical Metallurgy*, 2nd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.

REFERENCES:

1. William F. Hosford (2007), Materials Science, an Intermediate Text, Cambridge university press.
2. Dieter, George Ellwood, Mechanical Metallurgy, Copyright © 1988 McGraw-Hill Book Company (UK) Limited.
3. Michael F. Ashby and David R. H. Jones, Engineering Materials 2, an Introduction to Microstructures, Processing and Design Second Edition, Butterworth-Heinemann.
4. William D. Callister, Jr., Materials science and engineering: an introduction, John Wiley & Sons.
5. R. E. Smallman, R. J. Bishop, Modern Physical Metallurgy and Materials Engineering Science, process, applications, Butterworth-Heinemann
6. S.L. Kakani and Amit Kakani (2004), Materials Science, New Age International (P) Limited, Publishers.
7. Superalloys-A Technical Guide-M J Donachie & S J Donachie A S M International .Metal Park .Ohio
8. A S M Hand Book Vol-1
9. Mechanics of composite materials, ROBERT M. JONES, Taylor & Francis, U.S.A

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

ELECTRICAL TECHNOLOGY

Course Code: A3206

L	T	P	C
3	1	0	3

Course Overview:

The goal of this course is to give a good basic understanding of Electrical machines. The principle of operation and the construction details of various Electrical machines like DC Machines Transformers and AC Machines are studied. The basic mechanisms involved in the operation of various single phase machines are discussed.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Understand the basic principles of electrical circuit analysis.

CO2. Apply the basic knowledge of electrical circuit analysis to find the response in any branch of network using network theorems.

CO3. Apply the basic knowledge of DC Machines in finding their performance.

CO4. Apply the basic knowledge of AC Machines in finding their performance.

CO5. Develop the equivalent circuit and draw the phasor diagrams of AC machines for different types of loads.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

ELECTRICAL TECHNOLOGY

Course Code: A3206

L	T	P	C
3	1	0	3

SYLLABUS

UNIT - I **(Lectures 10)**

INTRODUCTION TO ELECTRICAL CIRCUITS: Concept of Circuit, R-L-C parameters, voltage and current sources, source transformation, voltage -current relationship for passive elements, Kirchhoff's laws, network reduction techniques, series, parallel and compound circuits, mesh analysis and Nodal analysis , star-to-delta or delta-to-star transformation and introduction to AC fundamentals

UNIT-II **(Lectures 8)**

NETWORK THEOREMS: Thevenin's, Norton's, Superposition, Reciprocity, Maximum Power Transfer, Tellegen's and Millman's theorems for DC excitations

UNIT - III **(Lectures 10)**

MAGNETIC CIRCUITS: Magnetic circuits: faraday's laws of electromagnetic induction, concept of self and mutual inductance

D.C GENERATORS: Principle of operation of DC Machines, EMF equation, types of generators, magnetization and load characteristics of DC generators.

D.C. MOTORS: Types of DC motors, characteristics of DC motors, losses and efficiency, Swinburne's test, speed control of DC shunt motor, flux and armature voltage control methods.

UNIT - IV **(Lectures 10)**

TRANSFORMERS: Principle of operation of single phase transformer, types, constructional features, phasor diagram on no load and load, equivalent circuit, losses and efficiency of transformer and regulation, OC and SC tests, predetermination of efficiency and regulation.

UNIT - V **(Lectures 10)**

THREE PHASE INDUCTION MOTORS: Principle of operation of three phase induction motors, slip ring and squirrel cage motors, slip-torque characteristics, efficiency calculation, starting methods

TEXT BOOKS:

1. Sudhakar, Shyammohan S. Palli (2008), Circuit and Networks, Tata McGraw Hill, New Delhi, India.
2. L. Theraja, A. K. Theraja (2011), A Text book of Electrical Technology (Volume-II), 4th edition, S. Chand Publications, New Delhi, India.

REFERENCE BOOKS:

1. Joseph A. Edminister (2002), Schaums outline of Electrical Circuits, 4thedition, McGraw Hill Publications, India.
2. J. B. Gupta (2006), Theory and Performance of Electrical Machines, S. K. Kataria & Sons, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

MACHINE DRAWING

Course Code: A3311

L	T	P	C
0	0	6	4

Course Overview:

Machine drawing is used to communicate the necessary technical information required for manufacture and assembly of machine components. These drawings follow rules laid down in national and International Organizations for Standards (ISO). Hence the knowledge of the different standards is very essential. Students have to be familiar with industrial drafting practices and thorough understanding of production drawings to make them fit in industries. The following topics have been covered to fulfill the above objectives. Classification of Machine Drawings, Principles of Drawings, Sectioning, Dimensioning, Limits, Fits and Tolerance, Symbols and Conventional Representation, Screw Fasteners, Key Joints, Coupling and its Types, Riveted Joints, Welded Joints, Structural Applications, Assembly Drawings, Production Drawings, Reproduction of Drawing, Introduction of Computer Aided Drafting, Introduction of Solid 3D Modeling.

Prerequisite(s):

Engineering Drawing-II (A3304).

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Identify the national and international standards pertaining to machine drawing.

CO2. Illustrate various machine components through drawings as per ISO standards.

CO3. Draw machine components by applying the principles of engineering drawing.

CO4. Compare part drawings and assembly drawings.

CO5. Prepare assembly drawings by applying drawing conventions.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

MACHINE DRAWING

Course Code: A3311

L	T	P	C
0	0	6	4

SYLLABUS

MACHINE DRAWING CONVENTIONS:

1. Need for drawing conventions – introduction to IS conventions
2. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears.
3. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
4. Title boxes, their size, location and details - common abbreviations & their liberal usage
5. Types of Drawings – working drawings for machine parts.

I. DRAWING OF MACHINE ELEMENTS AND SIMPLE PARTS

Selection of Views, additional views for the following machine elements and parts with every drawing proportion.

1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, Cotter and knuckle joints.
3. Riveted joints for plates
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and foot step bearings.

II. ASSEMBLY DRAWINGS:

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

1. Engine parts – stuffing boxes, cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly.
2. Other machine parts - Screws jacks, Machine Vices Plummer block, Lathe-Tailstock, Tool post and Revolving centre.
3. Valves: Steam stop valve, Spring loaded safety valve, Feed check valve and Air cock.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

TEXT BOOKS:

1. N. Sidheshwar, P.Kannaiah, (2009), *Machine Drawing*, Vol-1, 3rd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
2. K.L. Narayana, P. Kannaiah, K. Venkata Reddy, (2006), *Machine Drawing,* 3rd edition, New Age Publishers, New Delhi, India.

REFERENCE BOOKS:

1. Dhawan, (2008), *Machine Drawing*, *a Text book of Machine Drawing*, 4th edition, S. Chand Publications, New Delhi, India.
2. N. Siddeshwar, P.Kannaiah, V.V.S. Sastry (1999), *Machine Drawing,* 21st edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
3. A. Singh, (*2003), Machine Drawing*, 5th edition, Tata McGraw Hill education (P) Ltd, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

MECHANICS OF SOLIDS AND METALLURGY LAB

Course Code: A3312

L	T	P	C
0	0	3	2

Course Overview:

Basic properties of the materials are very important for designing any machine component. Principles behind the development and achieving the properties and use them for designing the components is discussed in this course. Application of theories and interpretation of basic data will also be demonstrated. Material selection and correlating them with their physical, mechanical and micro structural aspects will also be covered.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Apply methods to determine mechanical properties and elastic constants.

CO2. Estimate compressive strength of wood/concrete/brick materials.

CO3. Determine slope and deflection of beams.

CO4. Characterize the microstructures of different ferrous and non-ferrous metals.

CO5. Identify the effect of heat treatment and cooling rates on the properties of steels.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

MECHANICS OF SOLIDS AND METALLURGY LAB

Course Code: A3312

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

PART – A METALLURGY LAB:

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high C steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardeneability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

PART – B

MECHNICS OF SOLIDS LAB:

1. Tests on Universal Testing Machine.
   a. Tension test
   b. Compression test
   c. Shear test
   d. Bending Test
2. Bending test on
   a. Simple supported beam
   b. Cantilever beam
3. Hardness test
   a. Brinell's hardness test
   b. Rockwell hardness test
4. Impact test
   a. Charpy test.
   b. Izod test.
5. Test on springs
6. Tests on Compression Testing Machine

Note: Minimum 12 experiments are to be conducted taking at least 6 from each lab.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Course Code: A3209

L	T	P	C
0	0	3	2

Course Overview:

The goal of this course is to give a good basic understanding of Network theorems , Diodes ,transistors and Electrical machines. The analysis of various theorems like thevenin, Norton, maximum power transfer theorem will be used to solve the circuits for the calculation of voltage, current to reduce the complexity of the circuit. The different characteristics of electrical machines will be plotted by conducting various tests on them.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Analyze basic electrical Circuits in calculation of electrical parameters.

CO2. Analyze different circuits in application of mesh and Nodal analysis.

CO3. Able to conduct experiments on D.C. Generators and Dc Motors and plot the charecteristics.

CO4. Differentiate various speed control techniques that are used for dc shunt motors.

CO5. Analyze the tests of a single phase transformer and discuss about the operating conditions of a transformer.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Course Code: A3209

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

PART - A: ELECTRICAL CIRCUITS

1. Verifications of KVL and KCL for series and parallel networks
2. Determination of PN junction diode characteristics (forward and reverse bias)
3. Realization of full wave and half wave rectifier characteristics
4. Verification of Thevenins and Norton's theorems.
5. Verification of Maximum Power Transfer theorem.
6. Verification of Super Position and Reciprocity theorems.

PART - B: ELECTRICAL MACHINES

1. Open circuit characteristics of DC Shunt Generator
2. Brake test on DC Shunt motor and draw the characteristics.
3. Predetermination of efficiency of given DC Shunt machine.
4. Speed control of DC shunt Motor.
5. Open circuit and Short Circuit tests on Single Phase Transformer.
6. Brake test on three phase induction motors.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

GENDER SENSITIZATION

Course Code: A3021

L	T	P	C
0	3	0	0

Course Overview:

Gender Sensitization is one of the basic requirements for the normal development of an individual and primarily highlights the contribution of both the genders in creation and development of a well balanced society. A curriculum-based approach to bring a change is desired to inculcate sensitivity towards issues concerning the relationship between men and women, caste, declining sex ratio, struggles with discrimination, sexual harassment, new forums for justice, eve-teasing, etc., The need for this sensitivity has been felt and realized through times immemorial and in almost all kinds of human existence, across the globe.

Towards a World of Equals is a course that introduces you to different dimensions of the current discussion on gender issues through a variety of materials: academic studies, court cases, laws, theoretical analyses, newspaper reports, stories, poems, videos and autobiographical texts. The lessons critically scrutinize many commonly held assumptions about gender relations and demonstrate why they are unacceptable in a society committed to justice and equality.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Build the significance of the process of socialization and relationships between men and women on the basis of a just and equal world.

CO2. Examine the decline of female sex ratio and discrimination faced by people with different gender identities.

CO3. Take part in house work, in order to allow for equality and share equal family spaces.

CO4. Estimate women's contribution to the nation's economy.

CO5. Analyze the consequences of sexual violence and importance of consent in friendship and other relationships.

CO6. Perceive the invisibility of women in history and show how locating a women in history makes them

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME III Semester **VCE-R15**

GENDER SENSITIZATION

Course Code: A3021

L	T	P	C
0	3	0	0

SYLLABUS

1. **Gender Sensitization: Why should we study it?**

2. **Socialization: Making Women, Making Men**
   Introduction
   Preparing for womanhood Growing up male
   First lessons in caste Different masculinities

3. **Just Relationships: Being Together as Equals**
   Mary Kom and Onler
   Love and Acid just do not mix Love letters
   Mothers and fathers
   Further Reading: Rosa Parks-The Brave heart

4. **Missing Women: Sex Selection and Its Consequences**
   Declining Sex Ratio Demographic Consequences

5. **Gender Spectrum: Beyond the Binary**
   Two or Many?
   Struggles with Discrimination

6. **Additional Reading: Our Bodies, Our Health**

7. **Housework: The Invisible Labour** "My Mother doesn't work" "Share the load"

8. **Women's Work: Its Politics and Economics**
   Fact and fiction
   Unrecognized and unaccounted work
   Further Reading: wages and conditions of work.

9. **Sexual Harassment: Say No!** Sexual harassment, not eve-teasing Coping with everyday harassment
   Further Reading: "Chupulu"

10. **Domestic Violence: Speaking Out**
    Is home a safe place? When women unite (Film) Rebuilding lives
    Further Reading: New Forums for justice.

11. **Thinking about Sexual Violence**
    Blaming the Victim- " I Fought for my life…" Further Reading: The caste face of violence.

12. **Knowledge: Through the Lens of Gender**
    Point of view
    Gender and the structure of knowledge
    Further Reading: Unacknowledged women artists of Telangana

13. Whose History? Questions for Historians and Others

Reclaiming a Past Writing other Histories

Further Reading: Missing pages from modern Telangana history

TEXT BOOK:

1. "Towards a World of Equals: A Bilingual Textbook on Gender". Telugu Akademi, Hyderabad, 2015

ADDITIONAL RESOURCES:

1. www.worldofequals.org.in

SYLLABI FOR
IV SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

ENVIRONMENTAL SCIENCE

Course Code: A3010

L	T	P	C
3	0	0	3

Course Overview:

Environmental study is interconnected; interrelated and interdependent subject. Hence, it is multidisciplinary in nature. The present course is framed by expert committee of UGC under the direction of Honorable Supreme Court to be as a core module syllabus for all branches of higher education and to be implemented in all universities over India. The course is designed to create environmental awareness and consciousness among the present generation to become environmental responsible citizens. The course description is: multidisciplinary nature of environmental studies, Natural Resources: Renewable and non- renewable resources; Ecosystems; Biodiversity and its conservation; Environmental Pollution; Social Issues and the Environment; pollution control acts .The course is divided into five chapters for convenience of academic teaching.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Identify** the important components of environment

CO2. **Identify** global environmental problems and come out with best possible solutions.

CO3. **Apply** environmental laws for the protection of forest and wildlife.

CO4. **Apply** the knowledge of Environmental ethics to maintain harmonious relation between nature and human being.

CO5. **Illustrate** the major environmental effects of exploiting natural resources.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

ENVIRONMENTAL SCIENCE

Course Code: A3010

L	T	P	C
3	0	0	3

SYLLABUS

UNIT – I **(7 Lectures)**

ENVIRONMENTAL SCIENCE INTRODUCTION: Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance .Need for Public Awareness.

NATURAL RESOURCES: Renewable and non-renewable resources .Natural resources and associated problems.

FOREST RESOURCES: Use and over – exploitation, deforestation, Timber extraction, Mining, dams and other effects on forest and tribal people.

WATER RESOURCES: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems.

MINERAL RESOURCES: Use and exploitation, environmental effects of extracting and using mineral resources.

FOOD RESOURCES: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

ENERGY RESOURCES: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.

LAND RESOURCES: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources.

UNIT- II **(7 Lectures)**

ECOSYSTEMS: Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, grassland ecosystem, desert ecosystem, aquatic ecosystems

BIODIVERSITY AND ITS CONSERVATION: Introduction .Definition: genetic, species and ecosystem diversity. Value of BIODIVERSITY: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega diversity nation .Hot-spots of biodiversity. Threats to biodiversity- habitat loss, poaching of wildlife, man -wildlife conflicts. Endangered and endemic species of India .Conservation of biodiversity- In-situ and Ex-situ conservation of biodiversity.

UNIT - III **(12 Lectures)**

ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution and nuclear hazards, Ill effects of fireworks.

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies.

DISASTER MANAGEMENT: floods, earthquake, cyclone and landslides. E-waste and plastic waste-recycling and reuse

WATER CONSERVATION: rain water harvesting, watershed management .Resettlement and rehabilitation of people; its problems and concerns. Case Studies. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.

UNIT- IV **(8 Lectures)**

GREEN ENVIRONMENTAL ISSUES: Clean development mechanism, carbon foot printing, carbon credits, and carbon sequestration polluter pay principle. Green building practices. Approaches to green computing and nanotechnology.IS014000. Role of information Technology in Environment and human health. Case Studies.

UNIT – V **(8 Lectures)**

ENVIRONMENTALETHICS: Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. Public awareness.

ENVIRONMENTAL IMPACT ASSESSMENT: Conceptual facts of EIA, Baseline date acquisition, planning and management of impact studies, operational aspects of EIA, methods for impact identification, prediction of impacts (air, water, noise, soil, biological and socio- economics) .Environmental Management Plan. Role of NGOs in creating awareness among people regarding environmental issues.

TEXT BOOKS:

1. Erach Bharucha (2005), *Textbook of Environmental Studies for Undergraduate Courses*, Hyderabad, Universities Press.
2. Benny Joseph (2005), *Environmental Studies*, New Delhi, Tata McGraw Hill Publishing co. Ltd.

REFERENCE BOOKS:

1. Anubha Kaushik (2006), *Perspectives in Environmental Science*, 3rd Edition, New Delhi, New age international.
2. M Anji Reddy (2007), *Textbook of Environmental Sciences and Technology*, Hyderabad, BS Publications.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Code: A3011

L	T	P	C
3	1	0	3

Course Overview:

This course addresses the concepts, principles and techniques of Managerial Economics and Financial Analysis. It covers the fundamentals of Managerial Economics and its various techniques such as demand, elasticity of demand, demand forecasting, production laws, cost concepts, price determination in various type of markets and pricing strategies. Apart from Capital budgeting and its techniques, Financial Analysis gives clear idea about concepts and conventions of accounting, accounting procedures like journal, ledger, trial balance, balance sheet and interpretation of financial statements through ratios.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain and infer the concepts of Managerial Economics and Financial Accounting

CO2. Analyze the demand, production, cost and break even to know interrelationship of among variables and their impact

CO3. Classify the market structure to decide the fixation of suitable price.

CO4. Apply capital budgeting techniques to select best investment opportunity.

CO5. Prepare financial statements and analyze them to assess financial health of business

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Code: A3011

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I **(12 Lectures)**

INTRODUCTION TO MANAGERIAL ECONOMICS & DEMAND: Managerial Economics - Definition, Nature and Scope of Managerial Economics, –Demand Analysis: Demand- Types, Demand Determinants, Law of Demand and its exceptions.

ELASTICITY OF DEMAND: Types, Measurement and Significance, Demand Forecasting: Meaning, methods of demand forecasting.

UNIT – II **(10 Lectures)**

THEORY OF PRODUCTION: Production function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs. Laws of Production, Internal and External Economies of Scale.

COST & BREAK EVEN ANALYSIS: Cost concepts, Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break- Even Point (simple problems)- Managerial Significance and limitations of BEA.

UNIT – III **(8 Lectures)**

INTRODUCTION TO MARKETS: Market structures- Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, oligopoly - Price-Output Determination in case of Perfect Competition, Monopoly

Pricing: Objectives and Policies of Pricing- Methods of Pricing**:** Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization

UNIT – IV **(10 Lectures)**

CAPITAL AND CAPITAL BUDGETING: Capital and its significance, Types of Capital, Components of working capital & Factors determining the need of working capital. Methods and sources of raising finance.

CAPITAL BUDGETING: Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR), Net Present Value Method, Profitability Index, Internal rate of return (simple problems)

UNIT – V **(12 Lectures)**

INTRODUCTION TO FINANCIAL ACCOUNTING: Accounting Principles - Concepts, Conventions, Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts with simple adjustments.

FINANCIAL ANALYSIS THROUGH RATIOS: Importance, types: Liquidity Ratios, Activity Ratios, Turnover Ratios and Profitability ratios. (Simple problems)

TEXT BOOK

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.

REFERENCES

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2003.
2. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
3. Lipey &Chrystel, Economics, Oxford University Press.
4. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Thomson.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

THERMAL ENGINEERING – I

Course Code: A3314

L	T	P	C
4	0	0	4

Course Overview:

This course is intended to introduce basic concepts of internal combustion engines and air compressors. It includes the detailed study of the actual cycles and their analyses, concepts of normal & abnormal combustion in IC engines, Testing and Performance of Engines, and Compressors.

Prerequisite(s):

- Thermodynamics (A3309)

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Compare air standard cycles with actual and fuel air cycles.

CO2. Analyze combustion phenomenon in SI and CI engines.

CO3. Explain the performance parameters of internal combustion engines and compressors.

CO4. Solve the problems related to IC engines and compressors.

CO5. Evaluate the performance parameters of internal combustion engines and compressors.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

THERMAL ENGINEERING – I

Course Code: A3314

L	T	P	C
4	0	0	4

SYLLABUS

UNIT – I **(10 Lectures)**

I.C. ENGINES: Classification, Working principles, Valve and Port Timing Diagrams. Actual Cycles and Their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction.

UNIT – II **(10 Lectures)**

COMBUSTION IN S.I. ENGINES: Normal Combustion and abnormal combustion, Importance of flame speed and effect of engine variables, Type of Abnormal combustion, pre-ignition and knocking (explanation of) Fuel requirements and fuel rating, anti knock additives, combustion chamber – requirements, types. Combustion in C.I. Engines: Four stages of combustion, Delay period and its importance, Effect of engine variables, Diesel Knock, Need for air movement, open and divided combustion chambers and nozzles used - fuel requirements and fuel rating.

UNIT – III **(10 Lectures)**

TESTING AND PERFORMANCE OF IC ENGINES: Parameters of performance, measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power, Determination of frictional losses and indicated power, Performance test, Heat balance sheet.

UNIT – IV **(10 Lectures)**

RECIPROCATING COMPRESSORS: Classification of compressors, Principle of operation of reciprocating compressors, work required, Isothermal efficiency volumetric efficiency and effect of clearance, multi-stage compression, under cooling, saving of work, minimum work condition for multi-stage compression.

UNIT – V **(10 Lectures)**

CENTRIFUGAL COMPRESSORS: Mechanical details, principle of operation, velocity and pressure variation, impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient, velocity diagrams, power required.

AXIAL FLOW COMPRESSORS: Mechanical details, principle of operation, velocity triangles, energy transfer per stage, degree of reaction, work done factor, isentropic efficiency, pressure rise calculations, polytropic efficiency.

TEXT BOOKS:

1. V. Ganesan (2011), I.C. Engines, 3rd edition, Tata McGraw-Hill, New Delhi, India.
2. B. John Heywood (2011), internal combustion engine fundamentals, 2nd edition, Tata McGraw-Hill, New Delhi.
3. R. K. Rajput (2011), Thermal Engineering, 18th edition, Lakshmi Publications, New Delhi, India.

REFERENCE BOOKS:

1. Mathur, Sharma (2008), IC Engines, 3rd edition, Dhanpat Rai & Sons, New Delhi, India.
2. Pulkrabek (2008), Engineering fundamentals of IC Engines, 2 nd edition, Pearson Education, New Jersey.
3. Rudramoorthy (2003), Thermal Engineering, 5th edition, Tata McGraw-Hill, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

PRODUCTION TECHNOLOGY – I

Course Code: A3315

L	T	P	C
3	1	0	3

Course Overview:

Production Technology - I is an instructional program that prepares individuals on the manufacturing processes like casting, welding, metal working processes like rolling, forging etc., and plastic processing methods. This program also includes instructions on computations related to forces and power requirements in metal working processes.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Understand various manufacturing operations, including their capabilities, limitations, and applications.

CO2. Analyze products and be able to improve their manufacturability and to reduce their costs.

CO3. Analyze the thermal, metallurgical aspects during solidification in casting and welding and their role on quality of cast or weld objects.

CO4. Design the gating and riser system needed for defect free casting.

CO5. Apply knowledge on selection of suitable manufacturing process for the typical component.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

PRODUCTION TECHNOLOGY – I

Course Code: A3315

L	T	P	C
3	1	0	3

SYLLABUS

UNIT - I **(10 Lectures)**

CASTING: Introduction, Steps involved in making a casting, Advantages of casting and its applications; Pattern and Pattern making - Types of patterns, Materials used for patterns, pattern allowances, Principles of Gating system, Gating ratio and design of Gating system; Solidification of casting - Solidification of pure metal and alloys, short and long freezing range alloys; Risers - Types, function and design; Special casting processes - Centrifugal, Die and Investment casting; Methods of melting **-** Crucible melting and cupola operation, steel making processes.

UNIT - II **(10 Lectures)**

WELDING: Classification of welding processes, types of welds and welded joints and their characteristics, design of welded joints, Gas welding, ARC welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water) welding.

UNIT - III **(10 Lectures)**

INERT GAS WELDING: TIG and MIG welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering and Brazing. Heat affected zones in welding, welding defects, causes and remedies, destructive and nondestructive testing of welds.

CUTTING OF METALS: Oxy Acetylene Gas cutting, water plasma, cutting of ferrous and non-ferrous metals.

UNIT - IV **(10 Lectures)**

HOT WORKING AND COLD WORKING: Strain hardening, recovery, recrystallisation and grain growth, Comparison of properties of cold and hot worked parts.

ROLLING: Fundamentals, theory of rolling, types of Rolling mills, Forces in rolling and power requirements. Stamping, forming and other cold working processes: Blanking and piercing, Bending and forming, Drawing and its types, wire drawing and Tube drawing, coining, spinning, Forces and power requirement in the above operations.

FORGING: Principles of forging, Tools and dies, Types of Forging, Smith forging, Drop Forging, Roll forging, Rotary forging, forging defects.

UNIT - V **(10 Lectures)**

EXTRUSION OF METALS: Basic extrusion process and its characteristics, Hot extrusion and cold extrusion, Forward extrusion and backward extrusion, Impact extrusion, Hydrostatic extrusion.

PROCESSING OF PLASTICS: Types of Plastics, Properties, applications and their Processing methods and Equipment (blow and injection modeling).

TEXT BOOKS:

1. P. N. Rao (2011), Manufacturing Technology, Vol -1, 3rd edition, Tata McGraw- Hill education (P) Ltd, New Delhi.
2. S. Kalpakjin (2005), Manufacturing Engineering and Technology, 4th edition, Pearson Education, New Jersey.
3. Ghosh and Mallik(2014), Manufacturing Science, 2nd edition, Tata McGraw- Hill education (P) Ltd, New Delhi.

REFERENCE BOOKS:

1. R. K. Jain (2010), Production Technology, 16th edition, Khanna publishers, New Delhi, India.
2. S. Raghuwanshi (2011), A course in workshop Technology, Vol - II, 3rd Edition, Dhanpat Rai & Co, New Delhi, India.
3. Amithab Gosh and Ashok Kumar mallik (2014), Manufacturing science, 2nd edition, East-west press (p) Ltd, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

HYDRAULIC MACHINES

Course Code: A3316

L	T	P	C
3	1	0	3

Course Overview:

Hydraulic Machines deals with the effect of hydrodynamic force on various types of vanes and describes the hydraulic turbines, reciprocating pumps, centrifugal pumps and their performance. It also includes the working of various types of hydraulic systems like Hydraulic accumulator, Hydraulic Intensifier, Hydraulic ram, Hydraulic press, Hydraulic lift, Hydraulic crane, hydraulic couplings and torque converters and Air lift pump.

Prerequisite(s):

- Mechanics of Fluids (A3308)

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the basic concepts and working of hydraulic turbines, pumps and systems.
CO2. Classify the hydraulic turbines and pumps.
CO3. Solve problems of impact of jet on vanes using impulse momentum equation.
CO4. Analyze the performance of vanes, turbines and pumps.
CO5. Evaluate the design parameters of hydraulic turbines and pumps.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

HYDRAULIC MACHINES

Course Code: A3316

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I **(10 Lectures)**

IMPACT OF WATER JETS: Introduction, Impulse Momentum Principle and its applications, Hydrodynamic force of jets on stationary and moving flat plate, Inclined and Symmetrical Curved vanes, Series of flat and symmetrical vanes on wheel when Jet striking centrally. Force of jet on unsymmetrical stationary and moving vane when jet strikes tangentially at the tip, velocity triangles, Expressions for work done and efficiency, Angular momentum principle, force of jet on radial vanes.

UNIT – II **(10 Lectures)**

HYDRAULIC TURBINES: Introduction, Classification of hydraulic turbines, Pelton Wheel, Francis, Kaplan and propeller turbines, Work done and efficiency, Draft tube theory and types.

UNIT – III **(10 Lectures)**

PERFORMANCE OF TURBINES: Unit quantities, Unit head, Unit discharge and Unit power, Performance under specific conditions, Specific Speed and its expression, Performance characteristic curves, Model testing of turbines, Cavitation and its effects, Governing of turbines.

RECIPROCATING PUMPS: Main components and working of a reciprocating pump, Types of reciprocating pumps, Power required, Coefficient of discharge and slip, Indicator diagram, Effect of acceleration head in suction and delivery pipes, Effect of friction, Work saved by air vessels, Rate of flow into and from air vessel.

UNIT – IV **(10 Lectures)**

CENTRIFUGAL PUMPS: Types, major parts and working; Work done by the impeller, Manometric head, Losses and Efficiencies, Effect of vane angle on manometric efficiency, Minimum starting speed, diameters of impeller and pipes, Specific speed, Model testing of pumps, Pumps in series and parallel, performance of pumps characteristics curves, NPSH, Cavitation, Priming devices, Pump troubles and remedies.

UNIT – V **(10 Lectures)**

HYDRAULIC SYSTEMS: Introduction, Working of Hydraulic accumulator, Hydraulic Intensifier, Hydraulic ram, Hydraulic press, Hydraulic lift, Hydraulic crane, hydraulic couplings and torque converters, Air lift pump, Gear and Vane pumps, Hydraulic valves.

TEXT BOOKS:

1. Dr. P. N. Modi, Dr. S. M. Seth (2011), *Hydraulics and Fluid Mechanics including hydraulic machines,* 14th edition, AD. Computers, New Delhi, India.
2. S. P. Ojha, R. Berndtsson (2012), *Fluid Mechanics and Machinery*, Oxford Higher Education, USA.

REFERENCE BOOKS:

1. Dr. R. K. Bansal, (2011*), Fluid Mechanics and Hydraulic machines*, 11th edition, Laxmi publications Private limited, New Delhi, India.
2. Dr. A. K .Jain (2009), *Fluid Mechanics*, 10th edition, Khanna Publishers, New Delhi, India.
3. M. Fank White, (2011*), Fluid Mechanics* (SIE), 7th edition, Tata McGraw hill education (P) Ltd, New Delhi, India

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

KINEMATICS OF MACHINERY

Course Code: A3317

L	T	P	C
4	1	0	4

Course Overview:

This course deals with the fundamental concepts and principles applied by engineers in the design of structures and to provide in-depth knowledge in basic mechanisms. It builds upon the mathematics and physics courses, extending to learn the systematic way of solving problems and kinematics to understand what happens to a body when force(s) is/are applied to it. It aim also to engage students to understand the different methods of obtaining a mechanism and utilize analytical, mathematical and graphical aspects of kinematics for effective design.

Prerequisite(s):

- Engineering Mechanics-II (A3303)

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the principles of kinematic pairs, chains and their classification, degrees of freedom, inversions and planar mechanisms.

CO2. Analyze the planar mechanisms for position, velocity and acceleration.

CO3. Synthesize planar four bar and slider crank mechanisms for specified kinematic conditions.

CO4. Evaluate gear tooth geometry and select appropriate gears for the required applications.

CO5. Design cams and followers for specified motion profiles.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

KINEMATICS OF MACHINERY

Course Code: A3317

L	T	P	C
4	1	0	4

SYLLABUS

UNIT – I **(12 Lectures)**

MECHANISMS: Elements or Links, Classification, Rigid Link, flexible and fluid link, Types of kinematic pairs, sliding, turning, rolling, screw and spherical pairs, lower and higher pairs, closed and open pairs, constrained motion completely, partially or successfully constrained and incompletely constrained.

MACHINES: Mechanism and machine, kinematic chain, inversion of mechanism, inversions of four bar chain, Beam Engine, Coupling rod of a locomotive, Watt's indicator mechanism inversions of single slider crank chain - Pendulum pump, Oscillating cylinder engine, Rotary I.C. Engine, Crank and slotted lever quick return motion mechanism, Whit worth quick return motion mechanism and inversions of double slider crank chain- Elliptical trammel, Scotch yoke mechanism, Oldham's coupling.

UNIT–II **(12 Lectures)**

STRAIGHT LINE MOTION MECHANISMS: Straight line motion - Exact and approximate straight line mechanisms and its types, Peaucellier, Hart and Scott Russul, Grasshopper, Watts, Tchebicheff and Robert Mechanisms and Pantograph.

KINEMATICS: Velocity and acceleration, Motion of link in machine, Determination of Velocity and acceleration diagrams, Graphical method, Application of relative velocity method four bar chain.

PLANE MOTION OF BODY: Instantaneous center of rotation, centroids and axodes, relative motion between two bodies, three centre's in line theorem, Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT–II **(12 Lectures)**

ANALYSIS OF MECHANISMS: Analysis of slider crank chain for displacement, velocity and acceleration of slider, Acceleration diagram for a given mechanism, Klein's construction, Coriolis acceleration.

STEERING MECHANISMS: Conditions for correct steering, Davis Steering gear, Ackerman's steering gear, velocity ratio.

HOOKE'S JOINT: Single and double Hooke's joint, Universal coupling, application, problems.

UNIT – III **(10 Lectures)**

ANALYSIS OF MECHANISMS: Analysis of slider crank chain for displacement, velocity and acceleration of slider, Acceleration diagram for a given mechanism, Klein's construction, Coriolis acceleration.

STEERING MECHANISMS: Conditions for correct steering, Davis Steering gear, Ackerman's steering gear, velocity ratio.

HOOKE'S JOINT: Single and double Hooke's joint, Universal coupling, application, problems.

UNIT – IV **(12 Lectures)**

CAMS: Definitions of cam and followers, their uses, Types of followers and cams, Terminology, Types of follower motion, Uniform velocity, Simple harmonic motion and uniform acceleration and retardation- Dispacement, Velocity and acceleration diagrams. Construction of Cam profiles- Cam with knife edge follower, roller follower and flat faced follower. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

BELT ROPE AND CHAIN DRIVES: Introduction, Belt and rope drives, selection of belt drive- types of belt

drives-belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains-length, angular speed ratio, classification of chains.

UNIT– V **(10 Lectures)**

HIGHER PAIRS: friction wheels and toothed gears, types, law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding, phenomena of interferences, Methods of interference. Introduction to Helical, Bevel and worm gearing.
GEAR TRAINS: Introduction, Train value, Types, Simple and reverted wheel train, Epicyclic gear Train. Methods of finding train value or velocity ratio, Epicyclic gear trains.

TEXT BOOKS:

1. R. K. Bansal (2010), *Theory of machines*, 5th edition, Lakshmi Publications, Hyderabad, India.
2. V.P.Singh (2012),Theory of machines,3rd edition, Dhanapat Rai & Co, New Delhi, India
3. Thomas Bevan (2012), *Theory of machines*, 3rd edition, CBS Publishers, New Delhi, India.

REFERENCE BOOKS:

1. R. L. Norton(2011), *Kinematics and dynamics of machinery (SIE),* Tata McGraw-Hill education (P) Ltd, New Delhi, India.
2. Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", 3rd Edition, Oxford University Press, 2009.
3. S. S. Rattan(2009), *Theory of Machines and Mechanisms*, 3rd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.
4. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., New Delhi, 1988.
5. R. S. Khurmi, J. K. Gupta (2010), *Theory of machines*, S. Chand Publishers, New Delhi, India. Jagadish lal (2006), Theory of mechanisms and machines, 2nd edition, metropolitan book Co. Pvt.ltd.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Course Code: A3318

L	T	P	C
0	0	3	2

Course Overview:

This course introduces the measurement of flow rates through pipes using flow measuring devices and their calibration, study of major and minor losses, the impact of jet on vanes, the working and performance characteristics of hydraulic pumps and turbines.

Prerequisite(s):

- Mechanics of Fluids (A3308)

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. **Demonstrate** the working of flow meters and hydraulic machines.

CO2. **Evaluate** the discharge and co-efficient of discharge of flow meters.

CO3. **Identify** the type of flow through a pipe

CO4. **Estimate** the major and minor loss of flow through pipes.

CO5. **Determine** the performance parameters of vanes, hydraulic turbines and pumps

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Course Code: A3318

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

LIST OF EXPERIMENTS:

1. Calibration of Venturi meter.
2. Calibration of Orifice meter.
3. Calibration of Rectangular and Triangular notches.
4. Determination of friction factor for a given pipe line.
5. Determination of head loss due to pipe fittings.
6. Verification of Bernoulli's theorem
7. Study of Types of flow
8. Study of Impact of jets on Vanes.
9. Performance Test on Pelton Turbine.
10. Performance Test on Francis Turbine.
11. Performance Test on Kaplan Turbine.
12. Performance Test on Single Stage Centrifugal Pump.
13. Performance Test on Multi Stage Centrifugal Pump.
14. Performance Test on Reciprocating Pump.
15. Study of Hydraulic Jump

Note: Minimum 12 experiments are to be conducted from the above.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

PRODUCTION TECHNOLOGY LAB

Course Code: A3326

L	T	P	C
0	0	3	2

Course Overview:

Production Technology Lab is a program that practically prepares individuals on manufacturing processes like, Casting, welding, sheet metal operations and plastic processing methods. This program also includes experiments to find out the properties of moulding sand such as permeability and hardness.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Determine mould sand properties.
CO2. Prepare pattern for casting processes.
CO3. Apply various casting and welding techniques.
CO4. Perform different sheet metal operations.
CO5. Prepare plastic moulding technique.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME IV Semester **VCE-R15**

PRODUCTION TECHNOLOGY LAB

Course Code: A3326

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

I. Metal Casting Lab

1. Pattern Design and making
2. Sand properties testing - Exercise for strength and permeability
3. Moulding, Melting and Casting

II. Welding Lab

1. ARC Welding
2. Spot Welding
3. Oxy-Acetylene Gas Welding & Brazing
4. TIG Welding

III. Mechanical Press Working

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Bending operations

IV. Processing of Plastics

1. Injection Moulding
2. Blow Moulding

Note: Minimum 12 Experiments are to be conducted from the above trades.

SYLLABI FOR
V SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

DYNAMICS OF MACHINERY

Course Code: A3319

L	T	P	C
4	1	0	4

Course Overview:

This course expands on the mechanical engineering student's background in dynamic analysis and synthesis by providing significant skills and experience in modeling and controlling mechanical systems. The knowledge of this subject is very essential for an engineer in designing the various components and sub systems of a machine. Study of applications of gyroscopes is very helpful to learn the precession and its effect on motion. This course helps to learn the concepts and friction and friction devices like clutches, brakes and dynamometers. The static and dynamic balancing of masses and its effect on machines were covered in this course. The course exposes students on basic principles of vibrations for the analysis and design of machine elements and vibration systems.

Prerequisite(s): Basic knowledge on Mathematics and Kinematics of Machinery.

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Determine the value of gyroscopic couple and explain the effect of gyroscopic couple on all rotating bodies.

CO2. Apply the laws of friction and laws of motion to determine the power lost in brakes, clutches, pivots and calculate the forces developed in governors and torque developed in machine bodies.

CO3. Minimize the vibrations developed in engines due to unbalanced masses by balancing the rotating and reciprocating masses.

CO4. Determine the frequency of vibrations in different types of beams by using the concept of Simple harmonic Motion.

CO5. Discuss effectively on dynamics of machinery and work as a team for solving problems on reducing the effect of unwanted effect of forces developed in engines.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

DYNAMICS OF MACHINERY

Course Code: A3319

L	T	P	C
4	1	0	4

SYLLABUS

UNIT – I

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aeroplanes and ships.

FRICTION: Introduction, types of friction, limiting angle and angle of response, mechanism of dry friction, inclined planes, screw friction, friction circle, uniform pressure and wear theory, pivot and collar bearings.

UNIT – II

CLUTCHES: Friction clutches: Single Disc clutch, Multiple Disc Clutch, Cone Clutch and Centrifugal Clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, band brakes, band and black breaks, internal expanding brakes. Dynamometers: absorption and transmission types.

UNIT – III

TURNING MOMENT DIAGRAM AND FLY WHEELS: Turning moment-Inertia Torque - crank effort and torque diagrams, Fluctuation of energy, Fly wheels and its applications.

GOVERNERS: Watt, Porter and Proell Governors. Spring loaded governors – Hartnell and Hartung governors. Sensitiveness, isochronism and hunting.

UNIT – IV

BALANCING OF ROTATING MASSES: Single and multiple masses in single and different planes, Analytical and graphical methods.

BALANCING OF RECIPROCATING MASSES: Primary and Secondary balancing of reciprocating masses. Locomotive balancing - Hammer blow, Swaying couple, variation of tractive efforts.

UNIT – V

VIBRATION: Types of vibration-free and forced vibrations, undamped and damped vibrations, longitudinal, transverse and torsional vibrations. Single degree of freedom system, Dunkerlay's methods, Raleigh's method, whirling and critical speed of shafts.

TEXT BOOKS:

1. S. S. Rattan (2012), Theory of Machines, 3rd edition, Tata McGraw- Hill education (P) Ltd, New Delhi, India.
2. J. S. Rao, R. V. Dukkipati (2010), Mechanism and Machine Theory, New Age Publishers, New Delhi, India.

REFERENCE BOOKS:

1. Shiegly (2011), Theory of Machines, Tata McGraw hill education (P) Ltd, New Delhi, India.
2. Khurmi, R.S. (2011), Theory of machines, S. Chand publishers, New Delhi, India.
3. Thomas Bevan (2012), Theory of machines, 3rd edition, CBS Publishers, New Delhi, India.
4. Jagadish Lal, J. M. Shah (2009), Theory of Machines, Metropolitan, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

PRODUCTION TECHNOLOGY-II

Course Code: A3320

L	T	P	C
3	1	0	3

Course Overview:

Machine Tools is an instructional program that prepares individuals on the basic structure and importance of lathe, shaper, slotter, planer, drilling, milling and other machine tools, its many varieties, various operations and devices that are used to locate and support work pieces and cutting tools. This program also includes instructions on computations related to machining time, tool life and forces in metal cutting.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Apply the knowledge of cutting tool geometry, mechanism of chip formation and mechanics of orthogonal cutting.

CO2. Evaluate the tool life and cutting forces by using Taylor's tool life equation and Merchant circle diagram.

CO3. Explain the features, working principles and applications of lathe, shaper, planer, slotter, milling, drilling, grinding and broaching machines.

CO4. Analyze the various surface finishing operations like lapping honing and grinding.

CO5. Classify the various jigs, fixtures and clamping devices used in machining.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

PRODUCTION TECHNOLOGY – II

Course Code: A3320

L	T	P	C
3	1	-	3

SYLLABUS

UNIT - I

THEORY OF METAL CUTTING: Introduction: Basic elements of machining, sources of heat in metal cutting, basic definitions: cutting speed, feed and depth of cut, orthogonal and oblique cutting, classification of cutting tools, principal angles of single and multi-point tools, tool signature, tool geometry in coordinate system ASA and Orthogonal rake system, types of chips, chip thickness ratio, and chip breakers.

MECHANICS OF METAL CUTTING: Velocity relationships, force relationship in orthogonal cutting, Merchant's circle diagram, forces on a single point tools in turning, stress and strain in the chip, work done in cutting, popular metal cutting theories, tool life and wear, coolants, Machinability – Tool materials.

UNIT - II

LATHE: Principle of working, specification of lathe – types of lathe – work holders, tool holders – Box tool, Taper turning and thread turning – for Lathes and attachments. Turret and capstan lathes – collet chucks – other work holders – tool holding devices. Principal features of automatic lathes – classification – Single spindle and multi-spindle automatic lathes.

UNIT- III

SHAPING, SLOTTING AND PLANNING MACHINES: Principles of working – Principal parts – specification classification, operations performed. Kinematic scheme of the shaping, slotting and planning machines, machining time calculations.

Milling machine – Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – types of machining operations, geometry of milling cutters – Types of milling cutters – methods of indexing – Accessories to milling machines.

UNIT - IV

DRILLING AND BORING MACHINES: Principles of working, specifications, types of drilling operations performed – tool holding devices – twist drill- Deep hole drilling machine – Boring machines – Fine boring machines – Jig Boring machine.

Grinding machine – Fundamentals – Theory of grinding – classification of grinding machine – cylindrical and surface grinding machine – Tool and cutter grinding machine – special types of grinding machines – Different types of abrasives – bonds specification of a grinding wheel and selection of a grinding wheel

UNIT - V

MACHINING PROCESS AND SURFACE FINISHING: Lapping, honing and broaching machines: comparison to grinding – lapping and honing Principles of design of Jigs and fixtures and uses.

JIGS and FIXURES: Classification of Jigs & Fixtures – Principles of location and clamping – Types of clamping & work holding devices. Typical examples of jigs and fixtures.

TEXT BOOKS:

1. R. K. Jain (2010), Production Technology, 16th edition, Khanna publishers, New Delhi, India.
2. B. S. Raghu Vamshi (2010), Workshop Technology, Vol - II, 9th Edition, Dhanpat Rai Publishers, New Delhi, India.

REFERENCE BOOKS:

1. H.M.T. (Hindustan Machine Tools) (1980), Production Technology, 2nd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.
2. Dr. R. kesavan, B. VijayaRamanath (2012), Manufacturing Technology - II, 2nd edition, Laxmi publications, New Delhi, India.
3. G. C. Sen, A. Bhattacharya (2010), Principles of machine tools, 3rd edition, new central book agency (P) Ltd, New Delhi, India.
4. P N Rao (2009), Manufacturing Technology (Volume-2), 2nd Edition, Tata McGraw Hill, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

THERMAL ENGINEERING – II

Course Code: A3321

L	T	P	C
3	1	-	3

Course Overview:

Thermal Engineering is the applications of thermodynamics. The objective of the course is to introduce the mechanical engineering students an understanding of the performance of Rankine cycle, parameters to improve the performance like reheating, regenerating and also Gas turbines and Rocket engines and their performance. The knowledge of thermal engineering helps us in improving and designing the various thermodynamic systems. The course content is designed in such a way that better performance of Steam turbines, Gas turbines and different Jet & Propulsion units could be achieved by the calculation of different performance parameters.

Prerequisite(s): Engineering Thermodynamics & Thermal engineering-I

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the working principles of components of steam, gas turbine power plants and different jet propulsion systems.

CO2. Sketch various property diagrams and plot the cycle diagrams for steam, gas turbines and jet propulsion systems.

CO3. Derive the efficiency, property relations for Steam, Gas turbines and jet propulsion systems.

CO4. Solve problems of steam, gas turbines and jet propulsion systems.

CO5. Analyze the thermodynamic aspects of steam, gas turbines and jet propulsion systems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

THERMAL ENGINEERING - II

Course Code: A3321

L	T	P	C
3	1	-	3

SYLLABUS

UNIT – I

STEAM POWER CYCLE: Rankine cycle - Schematic layout, Comparison between Rankine Cycle and Carnot cycle. Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance, Regeneration and reheating.

UNIT – II

BOILERS: Classification, Working principles with sketches including H.P. Boilers, Mountings and Accessories, Working principles, efficiency and heat balance , Draught, classification, artificial draught, induced and forced draught.

STEAM CONDENSERS: Requirements of steam condensing plant, Classification of condensers, working principle, vacuum efficiency and condenser efficiency, air leakage, sources and its affects, air pump, cooling water requirement.

UNIT – III

STEAM NOZZLES: Function of nozzle, applications, types, Flow through nozzles, velocity of nozzle at exit-Ideal and actual expansion in nozzle, velocity coefficient, and condition for maximum discharge, criteria to decide nozzle shape.

STEAM TURBINES: Classification, Impulse turbine; Mechanical details, Velocity diagram, effect of friction, power developed, axial thrust, blade or diagram efficiency , condition for maximum efficiency. De-Laval Turbine - its features. Methods to reduce rotor speed-Velocity compounding and pressure compounding, Velocity and Pressure variation along the flow, combined velocity diagram for a velocity compounded impulse turbine.

UNIT – IV

REACTION TURBINE: Mechanical details, principle of operation, thermodynamic analysis of a stage, degree of reaction, velocity diagram, Parson's reaction turbine, condition for maximum efficiency.

GAS TURBINES: Simple gas turbine plant, Ideal cycle, essential components, parameters of performance, actual cycle , regeneration, inter cooling and reheating, optimum pressure ratio.

UNIT – V

JET PROPULSION: Principle of Operation ,Classification of jet propulsive engines , Working Principles with schematic diagrams and representation on T-S diagram , Thrust, Thrust Power and Propulsion Efficiency, Turbo jet engines Schematic Diagram, Thermodynamic Cycle, Performance Evaluation.

ROCKETS: Application, Working Principle, Classification, Propellant Type, Solid and Liquid propellant Rocket Engines.

TEXT BOOKS:

1. Mahesh M Rathore (2010), "Thermal Engineering" , Tata McGraw Hill Publishers, New Delhi,
2. S. Domkundwar, C.P. Kothandaraman A. Domkundwar(2010), A course in Thermal Engineering, Dhapatrai and Co., New Delhi.

REFERENCE BOOKS:

1. Sarkar B.K., (2007), "Thermal Engineering", 8th Reprint, Tata McGraw Hill Publishers, New Delhi,
2. Ganesan (2011), Gas Turbines, 3rd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.
3. Cohen, Rogers, Saravana Muttoo(2011), Gas Turbines, 9th edition, Addison Wesley Longman, NewDelhi, India.
4. P. Khajuria, S. P. Dubey (2009), Gas Turbines and Propulsive Systems, 5th edition, Dhanpat Rai Publications, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

DESIGN OF MACHINE MEMBERS - I

Course Code: A3322

L	T	P	C
4	1	0	4

Course Overview:

This course deals the Systematic approach to design, standardization, Design and Manufacturing, Engineering Materials, Simple Stresses and Compound Stresses in Machine Elements, Design For Strength, strength of mechanical elements; theories of failure under static and dynamic loading situations; impact loading, Design of Fasteners, Design of joints, Design Of Keys and cotter joints, Shaft, Shaft Couplings, Rivet Joints, Welded Joints.

Prerequisite(s): Engineering Mechanics, Mechanics of Solids

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the fundamental concepts of design for various design elements such as shafts, couplings, rivets, welded and bolted joints.

CO2. Apply theories of failure and fatigue failure criteria for the design of mechanical components.

CO3. Design of riveted, welded and bolted joints for various loading conditions.

CO4. Determine the dimensions of shaft with different geometrical features under various loading conditions.

CO5. Design shaft couplings for various operating conditions.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

DESIGN OF MACHINE MEMBERS - I

Course Code: A3322

L	T	P	C
4	1	0	4

SYLLABUS

UNIT – I

INTRODUCTION: General considerations in the design of Engineering Materials and their properties - selection- Manufacturing consideration in design- BIS codes of steels

STRESSES IN MACHINE MEMBERS: Simple stresses- Combined stresses-Torsional and bending stresses- impact stresses- stress strain relation- various theories of failure- factor of safety- Design for strength and rigidity- preferred numbers. The concept of stiffness in tension- bending- torsion and combined situations.

UNIT – II

STRESS CONCENTRATION: Definition- Reason for occurrence- Methods to reduce- Stress concentration factor. Design of stress concentrated members subjected to various loads.

DESIGN FOR VARIABLE LOADING: Types of variable/Cyclic loads Mean & amplitude Stresses- Fatigue Failure- Endurance Limit & Strength- S-N Diagram. Goodman and Soderberg criterion- Modifying factors- Problems on design of members for finite & infinite life in members subjected to individual & combined loading.

UNIT – III

RIVETED JOINTS: Introduction –types-Modes of failures of riveted joints-efficiency- eccentric loading.

WELDED JOINTS: Introduction-types-strength –un symmetrical section subjected to axial load.

UNIT – IV

BOLTED JOINTS: Design of bolts with pre-stresses, Design of joints under eccentric loading, locking devices, bolt of uniform strength.

KEYS- Introduction-types-stresses and strength of key

COTTERS AND KNUCKLE JOINTS: Introduction-types-spigot-socket & sleeve cotter joints- design of Knuckle joint.

UNIT – V

SHAFTS: Design of solid and hollow shafts for strength and rigidity- Design of shafts for combined bending and axial loads-Shaft sizes - BIS codes.

SHAFT COUPLING: Rigid couplings: Muff- Split muff and Flange couplings-Flexible coupling-Bushed pin Flexible coupling.

TEXT BOOKS:

1. V. Bandari (2011)- A Text Book of Design of Machine Elements- 3rd edition- Tata McGraw-Hill education (P) Ltd-New Delhi- India.
2. Pandya and Shah (2015), Machine Design, 20th Edition, Charotar Publication House, Anand, India.

REFERENCE BOOKS:

1. M F Spotts (2008), Design of Machine Elements, 8th Edition, Pearson Education (P) Ltd, New Delhi, India.
2. R. L. Norton (2006)- Machine Design (An Integrated approach)- 2nd edition- Pearson Publishers- Chennai- India.
3. Shigley- J. E (2011)- Mechanical Engineering Design- 9th edition- Tata McGraw-Hill- India.
4. P. Kannaiah (2012)- Machine Design- 2nd edition- SCITECH Publications India Pvt. Ltd- New Delhi- India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

OPERATIONS RESEARCH

Course Code: A3333

L	T	P	C
3	1	-	3

Course Overview:

Operations Research is a science of modeling and optimization. It allows you to model real- world problems by using mathematical techniques. It provides the tools and theories to solve these real-world problems by finding the optimal solutions to the models subject to constraints of time, labor, resource, material, and business rules. With Operations Research, people make intelligent decisions to develop and manage their processes and businesses in various applications.

Prerequisite (s): Linear Algebra, Matrix, Calculus, Statistics &Probability.

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the Operations Research features, models, applications and methods such as linear programming, transportation, sequencing, assignment, replacement, games theory and dynamic programming.

CO2. Build mathematical models for finding optimum solutions for various real world problems and case studies.

CO3. Evaluate various alternatives available to aid in effective decision making.

CO4. Choose the best strategies to maximize the profit in the presence of a competitor.

CO5. Devise operating policies for the efficient and effective management of men, materials and machines in inventory, production, distribution and service systems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

OPERATIONS RESEARCH

Course Code: A3333

L	T	P	C
3	1	-	3

SYLLABUS

UNIT - I

INTRODUCTION TO OPERATIONS RESEARCH: Basic definitions, Scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem, Formulation , Graphical solution of Linear Programming Problem.

ANALYTICAL METHODS: Basic simplex method, Artificial variables techniques, Big -M method, Two - phase method, Degeneracy.

UNIT - II

TRANSPORTATION PROBLEM: Formulation, unbalanced Transportation problem, maximization problem. Finding basic feasible solutions, North-West corner rule, least cost method and Vogel's approximation method. Optimality test – MODI method.

ASSIGNMENT MODEL: Formulation, Hungarian method for optimal solution, solving unbalanced problem, maximization Problem, Traveling salesman problem as assignment problem.

UNIT - III

SEQUENCING MODELS: INTRODUCTION: Johnsons Rule, Processing n Jobs through two machines, processing n Jobs through three machines, processing n Jobs through m Machines, Processing two Jobs through m machines.

QUEUING THEORY: Introduction, Single Channel, Poisson arrivals, exponential service times with infinite population and finite population models.

UNIT - IV

REPLACEMENT MODELS: Replacement of Items that Deteriorate whose maintenance costs increase with time without change in the money value, Replacement of Items that Deteriorate whose maintenance costs increase with time with change in the money value, Replacement of items that fail suddenly, individual replacement policy, group replacement policy.

INVENTORY MODELS: Inventory costs, Models with deterministic demand model: (a) Demand rate uniform and production rate infinite, (b) Demand rate non-uniform and production rate infinite, (c) Demand rate uniform and production rate finite. Price discounts.

UNIT - V

GAME THEORY: Competitive game, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle, Rectangular games without saddle point, mixed strategy for 2 X 2 games. Graphical method.

DYNAMIC PROGRAMMING: Characteristics of dynamic programming, Dynamic programming approach for Salesman allocation, Capital budgeting, Advertising, solving LPP by dynamic Programming Approach.

TEXT BOOKS:

1. J. K. Sharma (2016), *Operations Research – Theory and Applications, 6*th edition, Trinity Press Ltd New Delhi, India.
2. Frederick S Hillier; Gerald J Lieberman (2015), Introduction to Operations Research,10th Edition, McGraw- Hill , New York.

REFERENCE BOOKS:

1. Hamdy Abdelaziz Taha (2015), *Operations Research: an Introduction,* 9th edition, Pearson, Boston.
2. Prem Kumar Gupta & D S Hira (2015), *Operations Research*, Revised edition, S. Chand Publishing, New Delhi, India.
3. P Shankara Iyer (2008), Operations Research 1st Edition, Tata McGraw Hill, Publishing Company, New Delhi, India.
4. S Kalavathi (2012), Operations Research, 4th Edition, Vikas Publication.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

INSTRUMENTATION AND CONTROL SYSTEMS

Course Code: A3323

L	T	P	C
3	1	-	3

Course Overview:

This course covers the terminology, concepts, principles and computations used by engineers and technicians to specify, analysis and maintain instrumentation and control systems. It emphasizes practices in industry concepts, so that students learn what aspects of plant design and control are critical. Practical examples have been used for many common pressure, level, temperature and flow measuring systems. Approaches are presented for measurement selection, process/modification, and control system design.

Prerequisite(s): Engineering Mechanics, Fluid Mechanics, Basic Thermodynamics

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Identify the basic functional elements of a generalized measuring system, errors occurring in instrumentation and its remedial measures.

CO2. Categorize the mechanical, electrical and optical measuring instruments.

CO3. Apply skills in instrumentation, measurement and signal processing through vibration testing for several physical and mechanical systems.

CO4. Measure displacement, pressure, temperature, speed, flow, liquid level, stress, strain, humidity etc.

CO5. Make use of control systems for various applications.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

INSTRUMENTATION AND CONTROL SYSTEMS

Course Code: A3323

L	T	P	C
3	1	0	3

SYLLABUS

UNIT - I

INTRODUCTION: Definition, Basic principles of measurement, Measurement systems, generalized configuration and functional descriptions of measuring instruments, examples. Dynamic performance characteristics, sources of error, classification and elimination of error.

MEASUREMENT OF DISPLACEMENT: Theory and construction of various transducers to measure displacement, Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

UNIT - II

MEASUREMENT OF PRESSURE: Units, classification, basic principle used. Manometers, Bourdon tube pressure gauges, Bellows, Diaphragm gauges. Low pressure measurement, Thermal conductivity gauges, ionization pressure gauges, McLeod pressure gauge.

MEASUREMENT OF LEVEL: Direct method, Indirect methods, capacitive, ultrasonic, magnetic, Bubler level indicators.

FLOW MEASUREMENT: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hotwire anemometer, Laser Doppler Anemometer (LDA).

UNIT - III

MEASUREMENT OF SPEED: Mechanical Tachometers, Electrical tachometers, Stroboscope, Non-contact type of tachometer.

MEASUREMENT OF ACCELERATION AND VIBRATION: Different simple instruments, Principles of Seismic instruments, Vibrometer and accelerometer using this principle.

UNIT - IV

STRESS STRAIN MEASUREMENTS: Introduction to stream and strain stress and strain, electrical strain gauge , gauge factor , method of usage of resistance strain gauge for bending compressive and tensile strains , usage for measuring torque, Strain gauge Rosettes.

MEASUREMENT OF TEMPERATURE: Classification, Various Principles of measurement, Expansion, Electrical Resistance, Thermistor, Thermocouple, Pyrometers.

MEASUREMENT OF HUMIDITY: Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

UNIT - V

ELEMENTS OF CONTROL SYSTEMS: Introduction, Importance, Classification, Open loop and closed loop systems Servomechanisms, Examples with block diagrams, Temperature, speed & position control systems feedback control and its effects transfer function, block diagram and signal flow graph.

TEXT BOOKS:

1. D.S. Kumar,(2011), Mechanical Measurements and Controls, 4th edition, Metropolitan Book Co. Pvt Ltd., New Delhi, India**.**
2. T.G. Beckwith (2009), Mechanical measurements, 6th Edition, Pearson Publication, India.

REFERENCE BOOKS:

1. Er. R. K. Jain, (2011), Mechanical and Industrial Measurements, 12th edition, Khanna Publishers, New Delhi, India.
2. Chennakesava R. Alavala(2010), Principles of Industrial Instrumentation and Control Systems, 1st edition, Cengage Learning, New Delhi, India.
3. B. C. Nakra, K. K. Choudhary (2010), Instrumentation, measurement and analysis, 4th, Tata McGraw- Hill, New Delhi, India.
4. A. K. Tayal, (2004), Instrumentation and mechanical Measurements, 2nd edition, Galgotia Publications, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

THERMAL ENGINEERING & FUELS LAB

Course Code: A3324

L	T	P	C
0	0	3	2

Course Overview:

This course is designed for comprehensive study of combustion and thermal aspects in internal combustion engines, steam power plants and its allied components. This will enable the students to understand combustion phenomenon and thermal analysis of steam power plant components. The students will be able to identify, track and solve various combustion problems and evaluate theoretically the performance of various components involved in steam power plants and internal combustion engines.

Prerequisite(s): Basic Thermodynamics, Thermal Engineering – I

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Compare the performance of SI and CI engines.

CO2. Determine the performance parameters of internal combustion engines and compressor.

CO3. Analyze an engine under different loading conditions to calculate brake power, indicated power, friction power and efficiencies.

CO4. Find the properties of different fuels and lubricants.

CO5. Draw the valve and port timing diagrams of two stroke and four stroke engines.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

THERMAL ENGINEERING & FUELS LAB

Course Code: A3324

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

List of Experiments:

1. To conduct the Performance Test on Single Cylinder 4 Stroke Diesel Engine.
2. To conduct the Motoring Test on Single Cylinder 4-Stroke Diesel Engine.
3. To conduct the Heat Balance test on 4 – Stroke Diesel Engine.
4. To conduct the Performance Test on Single Cylinder two stroke Petrol Engine.
5. To conduct the Performance Test on Single Cylinder four stroke Petrol Engine.
6. To conduct the Performance Test on Four Stroke Single Cylinder Variable Compressor Ratio (VCR) Petrol Engine.
7. To conduct the Morse Test on Multi Cylinder 4 Stroke Petrol Engine.
8. To conduct the Performance Test on 2 Stroke Twin Cylinder Reciprocating Air Compressor.
9. To determine the flash point & fire point of a Liquid fuel.
10. To determine the Viscosity of a given lubricant oil using Redwood-I Viscometer.
11. To determine the Viscosity of a given lubricant oil using Redwood-II Viscometer.
12. To determine the Viscosity of a given lubricant oil using Saybolt Viscometer.
13. To Study the fire tube and water tube boilers.
14. To draw Valve Timing Diagram for 4-stroke diesel engine cut section model.
15. To draw Port Timing diagram for 2-stroke petrol engine cut section model.
16. Disassembly/assembly of an engine (old engine)

Note: Minimum 12 of the above experiments are to be conducted.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

THEORY OF MACHINES LAB

Course Code: A3325

L	T	P	C
0	0	3	2

Course Overview:

Theory of Machines lab is to impart practical knowledge on design and analysis of mechanisms for the specified type of motion in a machine. With the study of rigid bodies motions and forces for the transmission systems, machine kinematics and dynamics can be well understood. Demonstration exercises are provided with wide varieties of transmission element models to understand machine kinematics. Various experiments with governors, gyroscopes, balancing machines and universal vibration facilities are available to understand machine dynamics.

Prerequisite (s): Kinematics of machinery, Dynamics of machinery, Mechanical vibrations

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Examine the active and reactive couple based on the principle of angular momentum using gyroscope.

CO2. Apply the force couple polygon method for balancing the reciprocating and rotating mass systems.

CO3. Calculate the moment of inertia of various suspension and rotor systems.

CO4. Analyze the centrifugal forces in governors.

CO5. Determine the critical speed of shafts

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME V Semester **VCE-R15**

THEORY OF MACHINES LAB

Course Code: A3325

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

1. To determine the active and reactive gyroscopic couples and compare them.
2. To determine stiffness of the given helical spring, period and frequency of undamped free vibration of spring mass system.
3. To balance the given reciprocating mass system.
4. To balance the given rotating mass system with the aid of the force polygon and the couple polygon.
5. To determine the whirling speed of shaft.
6. To determine the characteristic curves of the spring loaded governor.
7. To determine the jump speed of a Cam for different weights
8. To plot n-ɵ curve for different cam follower pairs.
9. To determine the period and frequency of torsional vibration of the single rotor system.
10. To determine the period and frequency of torsional vibration of the two rotor system.
11. To study the transverse vibrations of a simply supported beam.
12. To determine angular velocity, angular acceleration, mass moment of inertia and centrifugal force of reciprocating masses.
13. To determine the natural frequency, radius of gyration and mass moment of inertia of the given rectangular bar experimentally.
14. To determine the radius of gyration and the moment of Inertia of a given circular plate.
15. To determine the mass moment of inertia of the given connecting rod by using oscillating method.

Note: Minimum 12 of the above experiments are to be conducted.

SYLLABI FOR
VI SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

DESIGN OF MACHINE MEMBERS - II

Course Code: A3327

L	T	P	C
3	1	0	3

Course Overview:

The design of machine members-II focusing mainly on design of gears, bearings, connecting rod, crankpin, crankshafts, pistons, cylinders, Spur, Helical, Bevel, Worm gears, power screws, mechanical springs. It analysis the strength and stiffness of the parts and suitable material for making of different machine elements.

Prerequisite (s): Engineering Mechanics, Mechanics of Solids.

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Illustrate different types of bearings, IC engine parts and power transmission elements related terminology.
CO2. Select the bearings for different operating conditions.
CO3. Design basic IC engine parts used in power transmission.
CO4. Determine the design parameters of gears and power screws.
CO5. Analyze helical compression and helical torsion springs with respect to loading.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

DESIGN OF MACHINE MEMBERS – II

Course Code: A3327

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I

BEARINGS:

Sliding Contact Bearing: Types of Journal bearings, basic modes of Lubrication, Bearing construction, bearing design, bearing materials, Selection of lubricants.

Rolling Contact Bearings: Types of rolling contact bearings ,selection of bearing types , selection of bearing life ,Design for cyclic loads and speeds , Static and dynamic loading of ball and roller bearings.

UNIT – II

DESIGN OF IC ENGINE PARTS: Design and proportions of: Cylinder-Cylinder Liners- Pistons- forces acting on piston - thrust in connecting rod- stress due to whipping action on connecting rod ends-Cranks and Crank shafts- strength and proportions of over hung cranks.

UNIT – III

SPUR GEAR DRIVES: Spur gears, Load concentration factor, and Dynamic load factor. Surface compressive strength, Bending strength, Design analysis of spur gears, Estimation of centre distance, module and face width, check for plastic deformation, Check for dynamic and wear considerations.

HELICAL GEAR DRIVES: Helical gears, Load concentration factor, and Dynamic load factor. Surface compressive strength, Bending strength, Design analysis of helical gears, Estimation of centre distance, module and face width, check for plastic deformation. Check for dynamic and wear considerations.

UNIT – IV

DESIGN OF BEVEL GEAR: Bevel gears, classification of Bevel Gears, Terms used in Bevel Gears, Determination of pitch angle for Bevel Gears, Proportions for Bevel Gears, Formative or Equivalent number of teeth for Bevel Gears, Forces acting on a Bevel Gear, Strength of Bevel Gears.

DESIGN OF WORM GEARS: Worm gears, properties of worm gears , Selection of materials , strength and wear rating of worm gears , Force analysis , Friction in worm gears , Thermal considerations

UNIT – V

DESIGN OF POWER SCREWS: Design of screw- Square- ACME- Buttress screws- design of nut- compound screw- differential screw- ball screw- possible failures.

MECHANICAL SPRINGS: Stresses and deflections of helical springs-Extension-compression springs-Springs for fatigue loading- natural frequency of helical springs - Energy storage capacity -helical torsion springs .

TEXT BOOKS:

1. V. Bandari (2011)- A Text Book of Design of Machine Elements- 3rd edition- Tata McGraw-Hill education (P) Ltd-New Delhi- India.
2. Pandya and Shah (2015), Machine Design, 20th Edition, Charotar Publication House, Anand, India.

REFERENCE BOOKS:

1. M F Spotts (2008), Design of Machine Elements, 8th Edition, Pearson Education (P) Ltd, New Delhi, India.
2. R. L. Norton (2006)- Machine Design (An Integrated approach)- 2nd edition- Pearson Publishers-Chennai- India.
3. Shigley- J. E (2011),Mechanical Engineering Design- 9th edition- Tata McGraw-Hill- India.
4. P. Kannaiah (2012)- Machine Design- 2nd edition- Scitech Publications India Pvt. Ltd- New Delhi-India.

DATA BOOKS PERMITTED:

1. S. M. D. Jalaludin (2014)- *Design Data Hand Book-2nd* edition- Anuradha Publishers- Kumbakonam-Chennai-India.
2. K. Mahadevan -K. Balaveera Reddy (2013)- *Design Data Hand Book- 4th edition* -CBS Publishers-New Delhi-India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

HEAT TRANSFER

Course Code: A3328

L	T	P	C
3	1	0	3

Course Overview:

The course presents the three modes of heat transfer: conduction, convection, and radiation. One-dimensional steady and transient conduction is studied for planar, cylindrical, and spherical geometries. The lumped capacitance analysis is used for transient conduction when appropriate. Convection heat transfer is studied in both internal and external geometries and under laminar and turbulent flow regimes. External flows include cooling on flat plates due to laminar and turbulent boundary layer flows, and cooling of cylinders due to cross flow. The convection heat transfer analysis in internal flows considers laminar and turbulent pipe flows. Free convection is also considered where heat transfer is due to flow induced by fluid buoyancy. Radiation heat transfer is studied by considering both the general characteristics of radiation as well as the properties of radiating surfaces and radiation heat transfer between surfaces.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Apply the principles of conduction, convection and radiation heat transfer to analyze natural phenomena.

CO2. Determine thermal resistance for conduction, convection and radiation heat transfer using fundamental relationships and correlations.

CO3. Analyze and apply empirical correlations in connection with convection, boiling and condensation.

CO4. Design and analyze the performance of heat exchangers and evaporators.

CO5. Examine blackbody and gray surface radiation, and evaluate radiation exchange between surfaces.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

HEAT TRANSFER

Course Code: A3328

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I

INTRODUCTION: Modes and mechanisms of heat transfer, Basic laws of heat transfer –Applications of heat transfer.

CONDUCTION HEAT TRANSFER: General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates. Different forms of general equation – Steady state and Transient heat transfer – Initial and boundary conditions. One dimensional steady state heat conduction through Homogeneous slabs, hollow cylinders and spheres, Overall heat transfer coefficient, Electrical analogy, Critical radius of insulation.

UNIT – II

ONE DIMENSIONAL, STEADY STATE HEAT CONDUCTION: Systems with variable thermal conductivity. Heat Transfer from Extended surfaces- Types of fins, Heat flow through rectangular and circular fins, Long, Short and insulated tips, fins losing heat at the tip, efficiency and effectiveness of fins.

ONE DIMENSIONAL, TRANSIENT HEAT CONDUCTION: Systems with negligible internal resistance, Significance of Biot and Fourier Numbers, Chart solutions of transient conduction systems

UNIT – III

CONVECTIVE HEAT TRANSFER: Concepts of Continuity, Momentum and Energy Equations. Dimensional analysis-Buckingham's Pi Theorem - Application for developing non-dimensional correlation for convective heat transfer.

FORCED CONVECTION: External Flows **–** Concepts of hydrodynamic and thermal boundary layer and use of empirical correlations for Flat plates and Cylinders. Internal Flows **–** Concepts about Hydrodynamic and Thermal Entry Lengths, use of empirical correlations for Horizontal Pipe Flow and annulus flow.

FREE CONVECTION: Development of Hydrodynamic and thermal boundary layer along a vertical plate – Use of empirical relations for Vertical plates and pipes.

UNIT IV

BOILING AND CONDENSATION: Regimes of Pool boiling and Flow boiling, Critical heat flux, Calculations on Nucleate Boiling. Film wise and drop wise condensation – Nusselt's theory of condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

HEAT EXCHANGERS: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor - Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

UNIT V

RADIATION HEAT TRANSFER: Emission characteristics – Laws of black-body radiation – Irradiation – Total and monochromatic quantities – Laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann – Heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

TEXT BOOKS:

1. D.S. Kumar, (2013), Heat and Man Transfer, Eight Edition, S.K. Kataria, New Delhi.
2. YUNUS A CENGEL, (2014), Heat Transfer A Practical Approach, TMH, New York

REFERENCE BOOKS:

1. M. Thirumaleshwar,(2009), Fundamentals of Heat & Mass Transfer, Second Edition, Pearson, India
2. R.C. Sachdeva, (2016), Fundamentals of Engineering, Heat & Mass Transfer, Third Edition, New Age, New Delhi
3. HOLMAN, (2008), Heat Transfer, Ninth Edition, TMH, New York
4. Incropera & Dewitt, (2009), Fundamentals of Heat Transfer, Sixth Edition, John Wiley, U.K.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

METROLOGY AND SURFACE ENGINEERING

Course Code: A3330

L	T	P	C
3	0	0	3

Course Overview:

To provide a basic understanding of the range of activities encompassed by personnel working in standards and calibration laboratories. It covers the measurement process, types and correct use of measurement and test equipment, and measurement standards. It provides an opportunity for students to learn about measurement and the procedures necessary to set up and to have knowledge on calibration.

Prerequisite (s): Production Technology - II

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Apply the knowledge of limits, fits and tolerance for interchangeability and selective assembly.

CO2. Measure the length, angles and other physical geometrical characteristics using various instruments, tools and techniques.

CO3. Use various measuring instruments such as Talysurf, comparators, toolmakers microscope, profile thread gauges, slip gauges, sine bars etc.

CO4. Determine the flatness and roughness of surface using various methods and tools.

CO5. Conduct alignment tests on machine tools such as lathe, milling and drilling machine.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

METROLOGY AND SURFACE ENGINEERING

Course Code: A3330

L	T	P	C
3	0	0	3

SYLLABUS

UNIT – I

SYSTEMS OF LIMITS AND FITS: Introduction, normal size, tolerance limits, deviations, allowance, fits and their types, unilateral and bilateral tolerance system, hole and shaft basis systems , interchangeability and selective assembly. Indian standard Institution system, British standard system.

UNIT – II

LINEAR MEASUREMENT: Length standard, line and end standard, slip gauges, calibration of the slip gauges, Dial indicator, micrometers.

MEASUREMENT OF ANGLES AND TAPERS: Different methods, Bevel protractor, angle slip gauges, spirit levels, sine bar, Sine plate, rollers and spheres used to determine the tapers.

LIMIT GAUGES: Taylor's principle, plug, ring, snap, gap, taper, profile and position gauges. Design of go and No go gauges

UNIT – III

OPTICAL MEASURING INSTRUMENTS: Tool maker's microscope and its uses, collimators, optical projector, optical flats and their uses, interferometer.

FLAT SURFACE MEASUREMENT: Measurement of flat surfaces, instruments used straight edges, surface plates, optical flat and auto collimator.

SCREW THREAD MEASUREMENT: Elements of measurement, errors in screw threads, measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

UNIT – IV

SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness-Numerical assessment of surface finish, CLA, Ra, R.M.S Values, Rz values, Methods of measurement of surface finish, profilograph. Talysurf, ISI symbols for indication of surface finish.

MEASUREMENT THROUGH COMPARATORS: Comparators, Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production.

MACHINE TOOL ALIGNMENT TESTS: Requirements of Machine Tool Alignment Tests, Alignment tests on lathe, milling, drilling machine tools. Preparation of acceptance charts.

UNIT – V

COORDINATE MEASURING MACHINES: Types of CMM, Role of CMM, and Applications of CMM.

SURFACE ENGINEERING: Surface texture and properties, Surface cleaning techniques, Surface integrity, Wear and its measurements, Lubricants and its selection for reducing wear, Principle of corrosion and remedial measurements, Laser applications for surface modifications.

MECHANICAL SURFACE TREATMENT: Surface treatment processes and their characteristics and applications. (a)Overlay coatings (b) Diffusion coatings (c) Thermal or mechanical modification of Surfaces

TEXT BOOKS:

1. R. K. Jain (2012), Engineering Metrology, 20th edition, Khanna Publishers, New Delhi, India.
2. J. R. Davis (2012), Surface engineering for corrosion and wear resistance, 3rd edition, Wood head Publishers, USA.

REFERENCE BOOKS:

1. K. L. Narayana (2010), Engineering Metrology, 2nd edition, Scitech publishers, Hyderabad, India.
2. Manohar Mahajan (2011), A Text Book of Metrology, 1st edition, Dhanpath Rai, New Delhi, India.
3. Anand K Bewoor, Vinay A Kulkarni (2009), Metrology and Measurement, 1st Edition, Tata Mc Graw Hill, Education, New Delhi, India
4. I C Gupta (2008), Engineering Metrology, 5th Edition, Dhanpath Rai, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

AUTOMOBILE ENGINEERING
(Professional Elective - I)

Course Code: A3351

L	T	P	C
4	0	0	4

Prerequisite(s): Thermodynamics, Thermal Engineering.

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the working components of four wheeler automobile
CO2. Classify the different ignition systems used in automobiles.
CO3. Differentiate various types of automobile Transmission.
CO4. Elaborate the requirements of fuel injection systems used in automobiles.
CO5. Discuss the steering control mechanism used in automobiles.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

AUTOMOBILE ENGINEERING
(Professional Elective - I)

Course Code: A3351

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION : Components of four wheeler automobile , chassis and body , rear wheel drive, front wheel drive, 4- wheel drive , types of automobile engines, engine construction, turbo charging and super charging, engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps , crank case ventilation , engine service, reboring, decarburization, Nitriding of crank shaft.

UNIT - II

FUEL SYSTEM: S.I. ENGINE: Fuel supply systems, Mechanical and electrical fuel pump, Electronic Fuel Injection pump filters, carburettor, types, air filters, petrol injection, Multipoint fuel injection for SI Engines.

C.I. ENGINES: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps. Multipoint fuel injection for CI Engines.

UNIT - III

COOLING SYSTEM : Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System, Radiators , Types , Cooling Fan - water pump, thermostat, evaporating cooling , pressure sealed cooling , antifreeze solutions.

IGNITION SYSTEM: Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser and spark plug, Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers, spark advance and retard mechanism.

UNIT - IV

TRANSMISSION SYSTEM: POWER UNIT & TRANSMISSION, MECHANICAL CLUCTHES, magnetic and centrifugal clutches, fluid fly wheel, gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter. Propeller shaft, Hotch, Kiss drive, Torque tube drive, universal joint, differential rear axles, types.

BRAKING SYSTEM: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes

UNIT - V

STEERING SYSTEM: Steering geometry, camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism, Ackerman steering mechanism, Davis steering mechanism, power steering system.

SUSPENSION SYSTEM: Objects of suspension systems, rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

TEXT BOOKS:

1. Kirpal Singh (2012), *Automobile Engineering - Vol. 1 &2*, 12th edition, standard publishers, New Delhi India.

2. William Crouse (2012), *Automobile Engineering (SIE)*, 10th edition, Tata McGraw hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. B. S. Narang (2011), *Automobile Engineering*, 5th edition, Karman publishers, New Delhi, India.
2. J. B. Gupta (2012), *Automobile Engineering*, satya prakhashan, New Delhi, India.
3. Internal Combusion engine fundamental by JOHN B. Heywood, McGraw Hill Publications, 1998
4. I C Engines by M Mathur & R P Sharma, Dhanapath Rai, Publications, 2010.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

ADVANCED STRENGTH OF MATERIALS

(Professional Elective - I)

Course Code: A3352

L	T	P	C
4	0	0	4

Course Overview:

This course is designed for students of Mechanical Engineering to enhance their knowledge and proficiency in the design analysis of "Structural materials" such as beams, columns and shafts. This course meets the needs of students in machine design and assists the students to determine the behaviour/response of materials to bending moments, shearing stresses and strains. Students will learn the principle of beam deformation under static and dynamic loads and the relationship between the radius of curvature, bending moments, bending stresses and material's cross-sectional dimensions is established. Students will also learn the principle of 'Beam Deflection' and establish the relationship between slope, deflection and radius of curvature for beams under various loading conditions

Prerequisite (s): Strength of Materials

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Remember the concepts of mechanics of solids and analyze the responses of structures (shear centre, curved beam, unsymmetrical bending) at different loading conditions.

CO2. Analyze the theory of elasticity and its application to plane stress and strain problems.

CO3. Examine the torsion problems with linear elastic solution of non-circular cross section with different analogies.

CO4. Explain the responses of structures on elastic foundation at various end conditions with different loading scenarios.

CO5. Analyze the influences of contact stress induced in structures.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

ADVANCED STREGNTH OF MATERIALS

(Professional Elective - I)

Course Code: A3352

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

SHEAR CENTER: Bending Axis and Shear Center- Shear Center for Axis-Symmetric and Unsymmetrical Sections.

UNSYMMETRICAL BENDING: Bending Stresses in beams Subjected to Nonsymmetrical Bending; Deflection of Straight Beams due to Nonsymmetrical Bending.

UNIT - II

CURVED BEAM THEORY: Winkler Bach Formula for Circumferential Stress, Limitations, Correction Factors, Radial Stress in Curved Beams, Closed Ring Subjected to Concentrated and Uniform Loads Stresses in Chain Links.

TORSION: Linear Elastic Solution; Prandtl Elastic Membrane (Soap-Film) Analogy; Narrow Rectangular Cross Section ; Hollow Thin wall Torsion Members, Multiply connected Cross Section.

UNIT - III

TWO DIMENSIONAL ELASTICITY PROBLEMS: Plane Stress and Plain Strain-Problems in Rectangular Coordinates, Bending of Cantilever Loaded at the End, Bending of a Beam by Uniform Load. Plane Stress and Plain Strain-Problems in Polar Coordinates, General Equations in Polar Coordinates, Stress Distribution Symmetrical about an Axis, Pure Bending of Curved bars, Displacements for Symmetrical Stress Distributions, Rotating discs.

UNIT - IV

BEAMS ON ELASTIC FOUNDATION: General theory - Infinite Beam Subjected to Concentrated Load: Boundary conditions - Infinite Beam Subjected to a Distributed Load Segment - Semi-infinite Beam Subjected to loads of its End - Semi-infinite Beam with Concentrated load near its End - Short Beams.

UNIT - V

CONTACT STRESSES: Introduction; Problem of Determining contact stresses; Assumptions on which a solution for contact stresses is based; Expressions for principal stresses; Method of computing contact stresses; Deflection of bodies in point contact; Stresses for two bodies in contact over narrow rectangular area (Line contact), Loads normal to area; Stresses for two bodies in line contact, Normal and Tangent to contact area.

TEXT BOOKS:

1. Arthur P. Boresi, Richard J. Schmidt (2009), *Advanced Mechanics Of Materials,* 6th Edition, Wiley India Ltd, New Delhi, India.
2. Stephan Timoshenko, J. N. Goodier (2010), *Theory of elasticity*, 3rd edition ,Tata McGraw Hill Education Private Limited, New Delhi, India.

REFERENCE BOOKS:

1. Jacob Pieter Den Hartog (1987), *advanced strength of materials*, New Edition, Dover Publications, New York.
2. Stephan Timoshenko (2010), *Theory of Plates & Shells*, 2nd Edition, Tata McGraw-Hill Education Private Limited, New Delhi, India.
3. Henry Taylor Bovey (2010), *Theory of Structures and Strength of Materials*, Photo Copy Edition, Nabu Press, USA.
4. Sadhu Singh (2009), *Strength of Materials,* 10th Edition, Khanna Publishers, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

WELDING TECHNOLOGY

(Professional Elective - I)

Course Code: A3353

L	T	P	C
4	0	0	4

Course Overview:

The welding technology program prepares students for employment in a variety of welding-related occupations in the manufacturing, industrial, or utility industries. The program teaches students basic to intermediate skills of major welding processes, Shielded Metal Arc (SMAW), Flux-Cored Arc (FCAW), Gas Metal Arc (GMAW), Gas Tungsten Arc (GTAW) and Resistance Welding Processes. This course also includes type of weld defects and tests.

Prerequisite (s): Production Technology

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain different types of welding processes and the principles guiding the operations.

CO2. Analyze the causes of welding defects and their prevention.

CO3. Select welding parameters to obtain desired mechanical properties of welded joints.

CO4. Describe arc welding and resistance welding processes.

CO5. Identify the welding equipment needed for different applications.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

WELDING TECHNOLOGY
(Professional Elective - I)

Course Code: A3353

L	T	P	C
4	0	0	4

SYLLABUS

UNIT – I

METAL JOINING PROCESS

Introduction, classification of welding processes as per AWS, commonly welded base metals, advantages and disadvantages of welding. Welding as compared to riveting and casting. Soldering, brazing, adhesive bonding processes, welding of dissimilar metals.

UNIT –II

GAS WELDING PROCESS

Introduction, oxy-acetylene welding, oxy-hydrogen, air-acetylene welding. Principle of operation, types of welding flames, Lighting the torch, flame adjustment, gas welding techniques, welding techniques-leftward & rightward. Filler metals and fluxes, gas welding equipments, applications.

UNIT – III

ARC WELDING PROCESSES

Introduction, Principle, Working, Specifications, Equipments, advantages and disadvantages, applications of Carbon arc welding, Flux Shielded Metal arc Welding, Gravity Welding, Sub Merged Arc Welding, GTAW Welding, GMAW Welding, CO_2 Welding, Flux Cored Arc Welding(FCAW),Electro Slag welding, Electro Gas welding, Plasma Arc Welding. Source of Power Supply: AC/DC & their characteristics.

UNIT – IV

RESISTANCE WELDING PROCESSES

Introduction, Principle, Working, Specifications, Equipments, advantages and disadvantages, applications of Spot welding, Seam welding, Projection Welding, Upset welding, Flash Butt welding, Percussion Welding.

UNIT – V

WELD DEFECTS & TESTS

Introduction, type of defects in weldments, causes and remedies of defects. Repair of defective welds, Visual examination of welding, Fabrication Weldability tests , Hydrostatic Pressure testing and Hydraulic or Gas Pressure testing for leakage, Use of NDT for weldments, Pre and post weld heat treatment, safety standards.

TEXT BOOKS:

1. ParmAr R. S., (1997) Welding Engineering and Technology, Khanna Publishers.
2. Welding Handbook, Volume 2, 7th Edition, American Welding Society.

REFERENCES:

1. Khanna O.P., A textbook of welding technology, Dhanpat Rai Publications, 22nd Edition, 2008.
2. Richard L Little, Welding and welding technology, McGraw-Hill Companies, 1973
3. Sindo Kou., Welding Metallurgy, Wiley Publishers, 2nd Edition, 2002.
4. Weman, Klas (2012), Welding Process hand book, 2nd Edition, Cambridge, Woodhead.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

MANUFACUTRING OF COMPOSITE MATERIALS
(Professional Elective - I)

Course Code: A3354

L	T	P	C
4	0	0	4

Course Overview:

The course deals with different types of composite materials required for various applications, manufacturing processes, testing and design.

Prerequisite(s): Basic Knowledge in Material science

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain various types of composite materials.
CO2. Compare the characteristics of composite materials.
CO3. Select the production processes for various composite materials.
CO4. Evaluate the strength of composite materials.
CO5. Recommend materials for advanced applications.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

MANUFACUTRING OF COMPOSITE MATERIALS

(Professional Elective - I)

Course Code: A3354

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION: Definition, Classification of Composite materials based on structure, based on matrix. Advantages of composites, application of composites, functional requirements of reinforcement and matrix. Properties of composite materials – strength, Fracture and toughness, Fatigue behavior.

UNIT - II

FIBERS: Preparation, properties and applications of glass fibers, carbon fibers, Kevlar fibers and metal fibers, properties and applications of whiskers, particle reinforcements.

UNIT - III

MANUFACTURING OF ADVANCED COMPOSITES: *Polymer matrix composites*: Preparation of Moulding compounds and prepregs, hand layup method, Autoclave method. Filament winding method, Compression moulding, Reaction injection moulding.

UNIT - IV

MANUFACTURING OF METAL MATRIX COMPOSITES: Casting, Solid State diffusion technique, Cladding - Hot isostatic pressing.
MANUFACTURING OF CERAMIC MATRIX COMPOSITES: Liquid Metal Infiltration, Liquid phase sintering.
MANUFACTURING OF CARBON – CARBON COMPOSITES: Knitting, Braiding, Weaving.

UNIT - V

RESPONSE OF COMPOSITES TO STRESS: (a) Isostrain condition (b) Isostress condition (c) Load friction shared by the fibers. Environmental effects of composites, Testing and inspection of composites.

TEXT BOOKS:

1. K. K. Chawla (2012), Composite Materials-Science & Engineering, 3rd Edition, Springer, USA.
2. Bryan Harris (1999), Engineering composite materials, 1st Edition, The Indian Institute of materials, London, U K.

REFERENCE BOOKS:

1. R W Cahn (2003), Material Science and Technology, Vol. 13, 3rd edition, VCH Wein Hein, West Germany.
2. E. D. Lubin (2007), Hand Book of Composite Materials, 1st edition, Wan Nostrand Hein Held, USA
3. P. K. Sinha (2006), Composite Materials and structure, 1st edition, IIT Kharagpur, India.
4. Mel M. Schwartz (1996), Composite materials: Properties, Nondestructive testing and repair, Prentice Hall publishers, New Jersey, USA.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

POWER PLANT ENGINEERING
(Professional Elective - II)

Course Code: A3355

L	T	P	C
4	0	0	4

Course Overview:

Systematic approach to describe available sources for producing power, working principle of different power plants and their basic components, functions of each component, importance of each component in different power plants, method to improve the performance. Power Plant Engineering focusing on sources for producing power like conventional sources –fuel as solid, liquid and gaseous, nuclear activity materials, non-conventional sources like solar energy, wind energy, tidal energy, working principle of different power plants like Steam power plant, Diesel power plant, Gas turbine power plant, Hydro-electric power plant, Nuclear power plant, and their basic components, functions of each component, describe power plant economics and environmental considerations.

Prerequisite (s): Thermodynamics

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Classify conventional and non-conventional power plants.
CO2. Explain the classification, working principle, components and auxiliaries, merits and limitations of various power plants.
CO3. Illustrate the layouts of conventional power plants with schematics.
CO4. Solve problems by considering economic and environmental aspects.
CO5. Analyze the performance of Diesel and Gas turbine power plants.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

POWER PLANT ENGINEERING
(Professional Elective - II)

Course Code: A3355

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION: Introduction to the Sources of Energy, Resources and Development of Power in India.
STEAM POWER PLANT: Plant Layout, Working of different Configurations, types of coals, Properties of coal, Fuel handling equipment, Ash handling systems.
COMBUSTION PROCESS: overfeed and under feed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, draught system, cyclone furnace, Dust collectors, cooling towers and heat rejection. Feed water treatment.

UNIT - II

INTERNAL COMBUSTION ENGINE PLANT: *Diesel Power Plant:* Introduction, IC Engines, types, construction, Plant layout with auxiliaries, fuel supply system, air starting equipment, lubrication and cooling system, super charging.
GAS TURBINE PLANT: Introduction, classification, construction Layout with auxiliaries, Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison.

UNIT - III

HYDRO ELECTRIC POWER PLANT: Water power, Hydrological cycle/ flow measurement, drainage area characteristics, Hydrographs, storage and Pondage, classification of dams and spill ways.
HYDRO PROJECTS AND PLANT: Classification, Typical layouts, plant auxiliaries, plant operation pumped storage plants.

UNIT - IV

POWER FROM NON-CONVENTIONAL SOURCES: Utilization of Solar, Collectors, Principle of Working, Wind Energy, types, HAWT, VAWT, Tidal Energy.
NUCLEAR POWER STATION: Nuclear fuel, breeding and fertile materials, Nuclear reactor, reactor operation.
TYPES OF REACTORS: Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding - radioactive waste disposal.

UNIT - V

DIRECT ENERGY CONVERSION: Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.
POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor - related exercises. Effluents from power plants and Impact on environment, pollutants and pollution standards, Methods of Pollution control.

TEXT BOOKS:

1. Arora and S. Domkundwar (2008), *A Course in Power Plant Engineering*, 5th edition, Dhanpat Rai & Co. Delhi.
2. P. K. Nag (2014), *Power Plant Engineering,* 4rd edition, Tata McGraw- Hill Publishing Company Ltd., New Delhi

REFERENCE BOOKS:

1. G.D. Rai (2009), *An Introduction to Power Plant Technology*, 3rd edition, Khanna Publications, New Delhi.
2. C. Elanchezhian, L. Saravana Kumar, B. Vijaya Ramkanth (2007), *Power plant Engineering,* 1st edition, I.K International Publishing House, New Delhi, India.
3. M M El-Walkil (2002), Power Plant Technology, 2nd Edition, Tata McGraw Hill, New Delhi, India.
4. A K Raja, A P Srivastava, Manish Dwivedi (2006), Power Plant Engineering, New age International Pvt. Ltd. New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

UNCONVENTIONAL MANUFACTURING PROCESSES
(Professional Elective - II)

Course Code: A3356

L	T	P	C
4	0	0	4

Course Overview:

The objective of Unconventional Machining is to lead the students to completely understand the unconventional machining processes. Therefore the course starting from the classification of unconventional machining processes based on the elementary mechanism and the machinability of materials with different unconventional processes, presents for each process the basic principles, the most relevant industrial solutions, and the main applications. The relevance of imposed tolerances on costs and production time and the modeling of unconventional machining processes are also taken into consideration.

Prerequisite (s): Understand basic Manufacturing methods and parameters

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Significance of the modern machining processes
CO2. Understand the latest machining technologies.
CO3. Knowledge of metal removal mechanism for various machining techniques.
CO4. Selection of machining process for various work materials
CO5. Apply suitable machining process for the typical component.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

UNCONVENTIONAL MANUFACTURING PROCESSES

(Professional Elective - II)

Course Code: A3356

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION: Need for non-traditional machining methods-Classification of modern machining processes, considerations in process selection, Materials, Applications.

UNIT - II

ULTRASONIC MACHINING: Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development. Abrasive jet machining, Water jet machining and abrasive water jet machine: Basic principles, equipments, process variables, mechanics of metal removal, MRR, application and limitations.

UNIT - III

ELECTRO CHEMICAL PROCESSES: Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process. Metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM, Simple problems for estimation of metal removal rate. Fundamentals of chemical, machining, advantages and applications.

UNIT - IV

THERMAL METAL REMOVAL PROCESSES : General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes, Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications.

UNIT - V

GENERATION AND CONTROL OF ELECTRON BEAM FOR MACHINING: Theory of electron beam machining, comparison of thermal and non-thermal processes, General Principle and application of laser beam machining - thermal features, cutting speed and accuracy of cut. Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries. Chemical machining, principle, maskants, etchants, applications.

TEXT BOOKS:

1. P. C. Pandey, H. S. Shah (2012), *Modern machining process*, 1st edition, Tata McGraw- Hill Publishing Company Ltd., New Delhi, India.
2. M Adithan (2014), Unconventional Machining Process, Atlantic Publications, New Delhi.

REFERENCE BOOKS:

1. V. K. Jain (2008), A*dvanced machining processes*, 3rd edition, Allied Publishers, New Delhi, India.
2. A. Bhattacharya(2009), *New Technology*, 2nd edition, the Institution of Engineers, India.
3. John R Walkar (2009), Machining Fundamentals, PHI Publications, New Delhi, India.
4. Rajput (2010), Manufacturing Technology, Laxmi Publications, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

NANO TECHNOLOGY

(Professional Elective - II)

Course Code: A3301

L	T	P	C
3	1	0	4

Course Overview:

Introduction to Nanotechnology provides a broad overview of nanotechnology, discussing the fundamental science of nanotechnology and its applications to engineering, mechanical, biomedical, and environmental fields.

The course provides a background of the understanding, motivation, implementation, impact, future, and implications of nanotechnology. The course will also discuss specific applications of nanotechnology in electronic devices, biomedical fields, environmental solutions, and energy production. This class is suitable for high school students interested in gaining a fundamental knowledge of nanoscience, in understanding current applications of nanotechnology, and in learning about future prospects in this field. Class presentations and weekly quizzes will allow the students to demonstrate their understanding of the material.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the features of nanomaterials and nanotechnology.
CO2. Identify the techniques for nanoparticle fabrication.
CO3. Categorize the operations for making the nanocomponents.
CO4. Evaluate the parameters applicable to complex problems in manufacturing process.
CO5. Compare the various tools and techniques to optimize the systems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

NANO TECHNOLOGY
(Professional Elective - II)

Course Code: A3357

L	T	P	C
3	1	0	4

SYLLABUS

UNIT - I

INTRODUCTION TO NANOTECHNOLOGY: Importance of nano scale, Nanostructure types, electronic, magnetic, optical Properties of Nano materials, top-down and bottom- up approach to nanostructures.

QUANTUM MECHANICAL PHENOMENON IN NANOSTRUCTURES: Quantum confinement of electrons in semiconductor Nano structures, one dimensional confinement (Quantum wires), two dimensional confinements (Quantum Wells), three dimensional confinements (Quantum dots).

UNIT - II

CARBON NANO STRUCTURES: Carbon nano tubes (CNTs), Fullerenes, C60, C80 and C240 Nanostructures, Properties (mechanical, optical and electrical) and applications.

UNIT - III

FABRICATION OF NANO MATERIALS: Physical Methods: Inert gas condensation, Arc discharge, RF plasma, Plasma arc technique, Ion sputtering, Laser ablation, Laser pyrolysis, Molecular beam epitaxy, Chemical vapour deposition method.

NANO SCALE CHARACTERIZATION TECHNIQUES: Scanning probe techniques (AFM, STM, SEM, TEM), XRD

UNIT - IV

NANO DEVICES AND NANO MEDICINE: Lab on chip for bio-analysis, Core/shell Nano particles in drug delivery systems (site specific and targeted drug delivery), cancer treatment, and bone tissue treatment.

UNIT - V

NANO AND MOLECULAR ELECTRONICS: Resonant-Tunneling structures, single electron tunneling, Single Electron transistors, coulomb blockade, giant magneto resistance, tunneling magneto resistance.

NANOLITHOGRAPHY AND NANO MANIPULATION: E-beam lithography and SEM based nanolithography and nano manipulation, Ion beam lithography, oxidation and metallization, Mask and its application, Deep UV lithography, X-ray based lithography.

TEXT BOOKS:

1. Charles. P. Poole (2010), Introduction to nanotechnology, Reprint Edition, Springer, Germany.
2. Bharat Bhusan (2010), Springer Handbook of Nanotechnology, 3rd edition, Springer, Germany.

REFERENCES BOOKS:

1. Phani kumar (2012), Principles of nanotechnology, 3rd edition, Scitech publications, India.
2. Challa S, S. Kumar (2007), Nanofabrication towards biomedical application: Techniques, tools Application and Impact, 1st edition, Wiley, VCH USA.
3. Hari Singh Nalwa (2011), Encyclopedia of Nanotechnology, American Scientific Publishers, USA.
4. Dutta (2009), Electron Transport in Mesoscopic systems, 8th Print, Cambridge University press, UK.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

PRODUCTION PLANNING AND CONTROL
(Professional Elective - II)

Course Code: A3358

L	T	P	C
4	0	0	4

Course Overview:

This course deals with functions of production planning and control, types of production systems and organizations in an industries, forecasting and their techniques in planning functions, significance of inventory management, line balancing in production processes, importance of scheduling and dispatching functions in an organization and also follow-up & expediting.

Pre-requisite: knowledge on production process and functions of industry

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain various elements of production, planning and control (PPC) and the role of computers in PPC.

CO2. Estimate the demand for products using forecasting techniques.

CO3. Determine operating policies for inventory control systems to manage inventories efficiently and effectively using the techniques such as ABC analysis, VED analysis, MRP, ERP, JIT etc.

CO4. Devise procedures and strategies for various functions of PPC such as aggregate planning, routing, scheduling, dispatching, and follow-up.

CO5. Apply line balancing techniques for the efficient management of assembly lines.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. MEVI Semester **VCE-R15**

PRODUCTION PLANNING AND CONTROL

(Professional Elective - II)

Course Code: A3358

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION: Definition, Objectives of production Planning and Control, Functions of production planning and control, Types of production Systems, Organization of production planning and control department.

FORECASTING: Definition , Uses of forecasting ,Factors affecting the forecasting ,Types of forecasting and their uses - Demand patterns, General principles of forecasting, Forecasting techniques , Quantitative techniques , Qualitative techniques , Measures of forecasting errors.

UNIT - II

INVENTORY MANAGEMENT: Functions of inventories, relevant inventory costs, ABC analysis, VED analysis, Basic EOQ model, Inventory control systems, Continuous preview systems and periodic preview systems MRP, ERP, JIT Systems.

UNIT - III

LINE BALANCING: Definition methods of line balancing, RPW method, Largest candidate method Routing, Routing procedure, Factors effecting routing - Procedure for routing sheets.

AGGREGATE PLANNING: Definition, Aggregate planning strategies, Aggregate planning methods, Transportation model.

UNIT - IV

SCHEDULING: Definition, Scheduling policies, Types of Scheduling methods, Differences with loading, Flow shop scheduling, job shop scheduling Line of balance (LOB), Objectives, Steps involved.

UNIT - V

DISPATCHING: Definition, Activities of dispatcher, Dispatching procedure, Various Forms used in dispatching.

FOLLOWUP & EXPEDITING Definition, Types of follow-up, Expediting, Definition, Expediting procedures, Applications of computers in planning and control.

TEXT BOOKS:

1. S. L. Narasimha (2010*), Production planning and inventory control*, 2nd edition, Prentice Hall of India Publishers, New Delhi, India.
2. Samuel Eilon(2011), *Elements of Production Planning and Control,* 2nd edition, Universal book corporation, Mumbai, India.

REFERENCE BOOKS:

1. Ravi Shankar (2010*), Industrial Engineering and management*, Galgotia Publishers, New Delhi, India.
2. Panner Selvanm(2012*), Production Operation Management*, 2nd edition, Prentice Hall of India Publishers, New Delhi, India.
3. Joseph S. Martinich(2010), *Production and Operations Management*, John Willey & Sons, New York.
4. K. C. Jain, L. N. Agarwal (2012), *Production planning and control and Industrial Management*, 6th edition Khanna publishers, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

HEAT TRANSFER LAB

Course Code: A3331

L	T	P	C
0	0	3	2

Course Overview:

This is a laboratory course in heat transfer to be taken in conjunction with the heat transfer theory course. Laboratory exercises will include studies of conduction, convection, and radiation heat transfer processes. Particular emphasis will be placed on thermal measurements including use of thermocouples. The Heat Transfer Laboratory experiments are set up so that experiments can be performed to complement the theoretical information taught in the heat transfer lecture course. This course deals with the experimental work in heat transfer lab covering measurement of thermal conductivity, Natural and forced convection, Radiation, and Heat exchangers.

Prerequisite(s): Basic Thermodynamics

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Determine the thermal conductivity of a given material.
CO2. Estimate the performance of heat exchangers and fins.
CO3. Determine the heat transfer coefficient in convection process.
CO4. Compare heat pipe performance with other pipes.
CO5. Determine the emissivity of a given material.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

HEAT TRANSFER LAB

Course Code: A3331

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

LIST OF EXPERIMENTS:

1. To determine the thermal resistance and thermal conductivity of composite slab.
2. To determine the thermal conductivity of lagged pipe.
3. To determine the thermal conductivity of insulating powder using concentric sphere.
4. To determine the thermal conductivity of a metal rod along its length.
5. To determine the efficiency of a pin-fin.
6. To determine the heat transfer coefficient in Transient Heat Conduction.
7. To determine the heat transfer coefficient for forced convection through pipe.
8. To determine the heat transfer coefficient for natural convection through pipe.
9. To determine the effectiveness and overall heat transfer coefficient of double pipe heat exchanger with Parallel and counter flow arrangement.
10. To determine the emissivity of a metal plate.
11. To determine the Stefan Boltzmann constant.
12. To determine the Overall heat transfer coefficient in drop and film wise condensation process.
13. To determine the critical Heat flux at different temperatures of water.
14. To compare the heat transfer through heat pipe with copper and stainless steel pipes.
15. To visualize the process of nucleate and film boiling on the heating element.

Note: Minimum 12 of the above experiments are to be conducted.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VI Semester **VCE-R15**

METROLOGY AND MACHINE TOOLS LAB

Course Code: A3332

L	T	P	C
0	0	3	2

Course Overview:

The lab sessions are intended to make the students understand the different operations in machines such as Lathe, Drilling Machine, Milling Machine, Grinding Machine etc. The student will be provided with a raw metal piece along with the dimensions of the required work piece.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Demonstrate the working principle and parts of different machine tools used in machine shop.

CO2. Apply the procedures to measure length, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness by using different instruments.

CO3. Inspect machine tools whether properly aligned or not.

CO4. Measure effective diameter of thread profile using different methods.

CO5. Create stepped surface using shaper and keyways using milling machine, perform different turning operations.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. MEVI Semester **VCE-R15**

METROLOGY AND MACHINE TOOLS LAB

Course Code: A3332

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS

PART - A: METROLOGY

1. Measurement of lengths, heights, diameters by Vernier calipers and micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth Vernier calipers and checking the chordal addendum and chordal height of spur gear.
4. Machine tool alignment of test on the lathe and milling machine.
5. Tool makers microscope and its application
6. Angle and taper measurements by Bevel protractor, Sine bars, etc.
7. Use of spirit level in finding the flatness of surface plate.
8. Thread measurement by two wire/ three wire method.
9. Surface roughness measurement by Taly Surf.

PART - B: MACHINE TOOLS

1. Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper, Planning machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.
2. Step turning and taper turning on lathe machine
3. Thread cutting and knurling on -lathe machine.
4. To drill a hole and perform tapping operation on given work piece
5. To perform shaping and planning operation on shaping machine and planning machine
6. To perform slotting operation on given work piece using slotting machine
7. To perform different types of milling operations on universal milling machine
8. To perform grinding operation on cylindrical grinding machine and surface grinding machine
9. Grinding of Tool angles.

Note: Minimum 12 experiments are to be conducted taking at least six from each lab

SYLLABI FOR
VII SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

FINITE ELEMENT METHODS

Course Code: A3329

L	T	P	C
3	1	0	3

Course Overview:

The course covers lessons in Finite Element Methods, Concept of a functional Stiffness matrix, Rayleigh–Ritz method, stress-strain relations, strain-displacement relations, shape functions, one dimensional problem, analysis of trusses, analysis of beams, 2-D problems, numerical integration, axisymmetric, heat transfer analysis and dynamic analysis.

Prerequisite (s): Basic calculus, Linear algebra, Mechanics of Solids, Matrix.

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Choose the type of analysis to solve the given problem.
CO2. Develop shape functions for 1D, 2D and 3D elements.
CO3. Model the given physical problem to mathematical form.
CO4. Analyze deformation of elements as per boundary and loading conditions.
CO5. Determine the stresses, strains and reaction forces in the element applying finite element methods.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

FINITE ELEMENT METHODS

Course Code: A3329

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I

INTRODUCTION TO FEM: Basic concept, historical background, application of FEM, general description, comparison of FEM with other methods. Basic equations of elasticity, Stress-strain relations, Strain-Displacement relations.

ONE DIMENSIONAL PROBLEM: Finite element modeling coordinates and shape functions. Potential Energy approach: Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

UNIT – II

ANALYSIS OF TRUSSES: Stiffness Matrix for plane truss and space truss elements, stress calculations. **ANALYSIS OF BEAMS:** Hermite shape functions-Element stiffness matrix for two nodes, two degrees of freedom per node beam element, load vector, deflection, stresses.

UNIT – III

PROBLEMS: CST-Stiffness matrix and load vector, Isoparametric element representation, Shape functions, convergence requirements, Problems.

FINITE ELEMENT MODELLING: Axisymmetric solids subjected to Axisymmetric loading with triangular elements. Two dimensional four noded Isoparametric elements and numerical integration.

UNIT – IV

STEADY STATE HEAT TRANSFER ANALYSIS: 1-D analysis of a fin and 2-D analysis of thin plate. Analysis of a uniform shaft subjected to torsion.

UNIT – V

DYNAMIC ANALYSIS: Formulation of finite element model, element matrices, Lumped and consistent mass matrices evaluation of Eigen values and Eigen vectors for a stepped bar and a beam.

TEXT BOOKS:

1. R. Tirupathi Chandrapatla (2011), *Introduction to Finite Elements in Engineering*, 4th edition, Pearson Education, India.
2. S. S. Rao (2012), *The Finite Element Methods in Engineering*, 5th edition, Elsevier, USA.
3. V. David. Hutton (2010), *Fundamentals of finite elements analysis*, 1st edition, Tata McGraw- Hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. Chennakesava R. Alavala (2009), *Finite elements methods*, 1st edition, second reprint, Prentice Hall of publishers, New Delhi, India.
2. J. N. Reddy (2010), *An introduction to Finite Element Method*, 3rd edition, Tata McGraw hill education (P) Ltd, New Delhi, India.
3. Kenneth H. Huebner, Donald L. Dewhirst, Douglas E. Smith , Ted G. Byrom (2009), *The Finite Element Method for Engineers*, 3rd edition, John Wiley & sons (ASIA) Pvt. Ltd., New York.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

COMPUTER AIDED DESIGN AND MANUFACTURING

Course Code: A3334

L	T	P	C
3	1	0	3

Course Overview:

Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) are two classes of application programs that help the user to design and build simple or complex products, assemblies, and plants. Nowadays, with the advent of fast personal computers, user friendly GUI interfaces, and much more efficient calculation algorithms, CAD/CAM has become a household name in the engineering and manufacturing field. In fact, because of these tools, an engineer has become a designer, eliminating the need for a full time drafter.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain various elements of computers, computer graphics, product cycle in manufacturing industry, drafting and modeling systems.

CO2. Model various synthetic curves and surfaces.

CO3. Develop NC part programming, group technology and computer aided process planning.

CO4. Perceive quality using computer aided quality control techniques.

CO5. Make use of computer integrated manufacturing systems in industries.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

COMPUTER AIDED DESIGN AND MANUFACTURING

Course Code: A3334

L	T	P	C
3	1	0	3

SYLLABUS

UNIT – I

Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, and storage devices.

COMPUTER GRAPHICS: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT – II

GEOMETRIC MODELING: Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

DRAFTING AND MODELING SYSTEMS: Basic geometric commands, layers, display control commands, editing, dimensioning, and solid modeling.

UNIT – III

NUMERICAL CONTROL: NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining centre, turning centre, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming.

GROUP TECH: Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

UNIT – IV

COMPUTER AIDED QUALITY CONTROL: Terminology in quality control, the computer in QC, contact inspection methods, noncontact inspection methods-optical, noncontact inspection methods-non optical, computer aided testing, integration of CAQC with CAD/CAM.

UNIT – V

COMPUTER INTEGRATED MANUFACTURING SYSTEMS: Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, CIMS benefits.

TEXT BOOKS:

1. Zimmers, P. Groover (2010), *CAD / CAM*, 3 rd edition, Prentice Hall of India, New Delhi.
2. Ibrahim Zeid(2011), *CAD / CAM Theory and Practice*, 4th edition, Tata McGraw Hill education (P) Ltd, New Delhi,India.

REFERENCES:

1. P. Groover(2011), *Automation, Production systems and Computer integrated Manufacturing*, 3rd edition, Pearson Publications, India.
2. Radhakrishnan, Subramanian (2009), *CAD / CAM / CIM*, New Age International Pvt. Ltd, New Delhi, India
3. Alavala, C. R (2012), *CAD/CAM: Concepts and Applications*, 1st edition, Prentice Hall of India, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

MANAGEMENT SCIENCE

Course Code: A3014

L	T	P	C
3	1	0	3

Course Overview:

Management science deals with nature, Importance of management and their functions, and different types of organizations, **P**lant location, Factors influencing location, Methods of production, Work study, Statistical quality control, Materials management purchase procedure, stores records, EOQ, ABC analysis, HRM, man power planning Recruitment , Selection, Training and development, Placement, Wage and salary administration, Promotion, Transfer, Performance appraisal, job evaluation and merit rating. Techniques in Project management, network analysis, Project cost analysis, project crashing.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Apply the concepts & principles of management in industry.

CO2. Design & develop organization structure for an enterprise.

CO3. Apply Quality Control techniques and Work-study principles in industry.

CO4. Handle purchase process and can determine Economic Order Quantity.

CO5. Apply the concepts of HRM in Recruitment, Selection and Training & Development.

CO6. Develop PERT/CPM Charts for projects of an enterprise and estimate time & cost of project.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

MANAGEMENT SCIENCE

Course Code: A3014

L	T	P	C
3	1	0	3

SYLLABUS

UNIT I

INTRODUCTION: Management - Definition, Nature, Importance of management, Functions of Management - Taylor's scientific management theory, Fayol's principles of management, Contribution of Elton mayo, Maslow, Herzberg, Douglas MC Gregor, Basic concepts of Organisation- Authority, Responsibility, Delegation of Authority, Span of control, Departmentation and Decentralization - Organisation structures (Line organization, Line and staff organization, Functional organization, Committee organization, Matrix organization)

UNIT II

OPERATIONS MANAGEMENT: Plant location, Factors influencing location, Principles and types of plant layouts - Methods of production (job, batch and mass production), Work study - Basic procedure involved in method study and Work measurement.

UNIT III

QUALITY CONTROL AND MATERIALS MANAGEMENT: Statistical quality control - Variables and attributes - X chart, R Chart, C Chart, P Chart, (simple Problems) Acceptance sampling, Sampling plans, Deming's contribution to quality. Materials management – objectives, Need for inventory control, Purchase procedure, Store records, EOQ, ABC analysis, Stock levels.

UNIT IV

HUMAN RESOURCE MANAGEMENT (HRM): Concepts of HRM, Basic functions of HR manager: Man power planning, Recruitment, Selection, Training and development, Placement, Wage and salary, Promotion, Transfers, performance appraisal, Job evaluation and Merit rating.

UNIT V

PROJECT MANAGEMENT: Early techniques in project management - Network analysis: Programme evaluation and review technique (PERT), Critical path method (CPM), Identifying critical path, Probability of completing project within given time, Project cost analysis, project crashing (simple problems)

TEXT BOOKS:

1. Dr. A.R. Aryasri, Management Science, TMH, 4th edition, 2009

REFERENCES:

1. Koontz & weihrich – Essentials of management, TMH, 8th edition, 2010
2. Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi, 2004
3. O.P. Khana, Industrial engineering and Management, L. S. Srinath, PERT & CPM.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

RENEWABLE ENERGY SYSTEMS

(Professional Elective - III)

Course Code: A3359

L	T	P	C
4	0	0	4

Course Overview:

This subject deals the fundamentals, of the different renewable energy systems like photo voltaic power generation, wind, solar cells, MHD power generation systems, turbines and generators, bio-energy, hydro, and geothermal energy systems.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Illustrate various renewable energy technologies and systems.

CO2. Identify various forms of renewable energy sources by imparting the knowledge of storage technologies.

CO3. Apply the knowledge and understanding of various possible mechanisms to develop renewable energy projects.

CO4. Explain the performance characteristics of renewable energy sources and policies associated with energy sources.

CO5. Evaluate the techno economic analysis of renewable energy systems and conduct life cycle analysis of renewable sources.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

RENEWABLE ENERGY SYSTEMS

(Professional Elective - III)

Course Code: A3359

L	T	P	C
4	0	0	4

SYLLABUS

UNIT-I:

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

UNIT-II:

Principles of MHD power generation, ideal MHD generator performance, practical MHD generator, wind energy conversion: power from wind, properties of air and wind, type of wind Turbines, operating characteristics.

UNIT-III:

Tides and tidal power stations, modes of operation, tidal project examples, turbines and generators for tidal power generation wave energy conversion: properties of waves and power content, vertex motion of waves, device applications. Types of ocean thermal energy conversion systems application of OTEC systems examples

UNIT-IV:

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

UNIT-V:

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

TEXTBOOKS:

1. “Energy conversion systems” by Rakosh das Begamudre, New age, International publishers, New Delhi, 2nd edition, 2007.
2. “Renewable Energy Resources” by John Twidell and Tony Weir, Taylor & Francis Publishers, 3rd Edition, 2015

REFERENCES:

1.“Understanding renewable energy system” by Volker Quarchining , Routledge publishersw, 2nd Edition, 2016

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

DESIGN OF PRODUCTION TOOLING

(Professional Elective - III)

Course Code: A3360

L	T	P	C
4	0	0	4

Course Overview:

This course deals with tool materials, design of cutting tools, design of work holding devices, design of tool holders, economics of machining, design of jigs and fixtures used in operations like turning, drilling, milling, grinding, welding, press tools used in die casting, forming, drawing and forging operations

Pre-requisite(s): knowledge on production technology and machine tools

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Interpret the geometrical and dimensional details of a production drawing.
CO2. Classify the various jigs, fixtures and clamping devices used during machining.
CO3. Identify various tools for the different machining processes.
CO4. Design single point and multipoint cutting tools.
CO5. Understand theory of deformation, stages of cutting operation.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

DESIGN OF PRODUCTION TOOLING

(Professional Elective - III)

Course Code: A3360

L	T	P	C
4	0	0	4

SYLLABUS

UNIT-I

DESIGN OF CUTTING TOOLS: Tool materials, design of single point cutting tool, form tool, drill, reamer, broach & plain milling cutter.

UNIT-II

THEORY OF METAL CUTTING: Design of tool holders for single point tools, Boring bars, selection of tools for machining applications, economics of machining

UNIT-III

DESIGN OF FIXTURES: standard work holding devices, principles of location and clamping, clamping methods and elements, quick-acting clamps, design of milling fixtures for simple components, Turning, Grinding, Welding fixtures. Inspection fixtures and design of gauges

UNIT-IV

DESIGN OF DRILL JIGS: Types of Jigs: Plate, Leaf, Turn over & Box Jigs, design of drill jigs for machining simple components, Drill bush

UNIT-V

DESIGN OF PRESS TOOLS: Introduction to press tools and related terminology, effect of clearances, theory of deformation, stages of cutting operation, die and punch design, design of sheet metal bending, forming and drawing dies, methods of mounting punches and dies, design of dies for diecasting and forging.

TEXT BOOKS:

1. Cyril Donaldson, Lecain and Goold: Tool Design – Tata Mc Graw Hill publications
2. A Bhattacharyya: Metal Cutting – Theory and Practice – Central Book Agency Kolkata

REFERENCES:

1. Fundamentals of Tool Design – Prentice Hall
2. F W Wilson: Hand Book of Fixture Design - Mc Graw Hill publications

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

NDT TECHNIQUES

(Professional Elective - III)

Course Code: A3361

L	T	P	C
4	0	0	4

Course Overview:

Nondestructive testing (NDT) is the process of inspecting, testing, or evaluating materials, components or assemblies for discontinuities, or differences in characteristics without destroying the serviceability of the part or system. In other words, when the inspection or test is completed the part can still be used.

Today modern nondestructive tests are used in manufacturing, fabrication and in-service inspections to ensure product integrity and reliability, to control manufacturing processes, lower production costs and to maintain a uniform quality level. During construction, NDT is used to ensure the quality of materials and joining processes during the fabrication and erection phases, and in-service NDT inspections are used to ensure that the products in use continue to have the integrity necessary to ensure their usefulness and the safety of the public.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the operation of various NDT equipment used for inspection of metals and non metals.
CO2. Apply scientific and technical knowledge to the field of non destructive testing.
CO3. Adapt the relevant non destructive testing method for various engineering practice.
CO4. Conduct the experiments and validate the report.
CO5. Test the product quality and manufacturing defects using emerging technologies.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

NDT TECHNIQUES

(Professional Elective - III)

Course Code: A3361

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION: Scope and advantages of NDT, comparison of NDT with DT. *Visual Methods*: Optical aids, In-situ metallographic, Optical holographic methods, Dynamic inspection.

UNIT - II

PENETRANT FLAW DETECTION: Principles, Process, Penetrant systems, Liquid penetrant materials, Emulsifiers, cleaners developers, sensitivity, Advantages, Limitations, Applications.

UNIT - III

RADIOGRAPHIC METHODS: Limitations, Principles of radiography, sources of radiation, Ionizing radiation, X-rays sources, Gama-rays sources recording of radiation, Radiographic sensitivity, and Fluoroscopic methods.

ULTRASONIC TESTING OF MATERIALS: Advantages, disadvantages, Applications, Generation of Ultrasonic waves, general characteristics of ultrasonic waves - methods and instruments for ultrasonic materials testing.

UNIT - IV

MAGNETIC METHODS: Advantages, Limitations, Methods of generating fields, magnetic particles and suspending liquids Magnetography, field sensitive probes, applications.

ELECTRICAL METHODS: Eddy current methods: potential-drop methods, applications.

UNIT - V

ELECTROMAGNETIC TESTING: Magnetism, Magnetic domains, Magnetization curves, Magnetic Hysteresis, Hysteresis-loop tests, comparator - bridge tests, Absolute single-coil system, applications.

OTHER METHODS: Acoustic Emission methods, Acoustic methods, Leak detection, Thermal inspection.

TEXT BOOKS*:*

1. Prasad (2011), *Non- Destructive Test and Evaluation of Materials*, 1st edition, Tata McGraw-Hill, New Delhi.
2. R. Halmshaw (1991), *Non-Destructive Testing*, 2nd edition, Edward Arnold, America.

REFERENCE BOOKS:

1. Jack Blitz (1997), *Electrical and Magnetic Methods of Non-Destructive Testing,* Springer, Germany.
2. Jack Blitz (1997), *Ultrasonic Methods of Non-Destructive Testing,* Springer, Germany.
3. Ravi Prakash (2009), *Non-destructive Testing Techniques*, 2nd Edition, New Academic Science Ltd., UK.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

MATERIALS FOR HIGH TEMPERATURE APPLICATIONS

(Professional Elective - III)

Course Code: A3362

L	T	P	C
4	0	0	4

Course Overview:

This course deals with different types of high temperature materials, their functional requirements, processing etc. Enhancement of life by thermal barrier coating also will be discussed.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the property requirements of high temperature materials.

CO2. Interpret the condition of use in order to select the correct material for specific application.

CO3. Choose the appropriate manufacturing process of high temperature materials.

CO4. Correlate high temperature material properties with application.

CO5. Evaluate and recommend material for advanced applications.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

MATERIALS FOR HIGH TEMPERATURE APPLICATIONS

(Professional Elective - III)

Course Code: A3362

L	T	P	C
4	0	0	4

SYLLABUS

UNIT- I

Introduction to high temperature materials –needs for high temperature materials, requirement of high temperature materials – environmental – oxidation, sulphidation – corrosion and erosion – mechanical behaviour and physical properties – strength, creep, fatigue Types of high temperature materials – metallic, ceramic, composites and intermetallic.

UNIT -II

Metallic Material- Super alloys, Types- Nickel base, Iron base, cobalt base. , application
Strengthening mechanism – solid solution, precipitation and Dispersion strengthening – other phases like TCP phase and delta phase, Refractory metals- types, characteristics and their application.

UNIT-III

High temperature ceramics - types – properties and applications. Intermetallic materials – titanium aluminides, nickel aluminides, Iron aluminides – properties and applications. High temperature composite materials – metal matrix composites, carbon-carbon composites, titanium matrix composites, intermetallic matrix composites.

UNIT-IV

Processing of super alloys – primary melting, secondary melting, hot and cold working. Heat treatment Advanced super alloy-– single crystal and dispersion strengthening alloys- types and processing Processing of high temperature ceramics and composites

UNIT-V

Coating for high temperature materials – corrosion and oxidation resistant coating, Thermal barrier coating. Design and manufacture – plant design and material selection – component manufacture – process models – component life extension.

TEXT BOOKS

1. Materials for high temperature engineering applications- 2000–Metham G.W. Van de Voorde, Ist edition MH Springer Publications, New York.
2. Super alloys – A thermal guide – 2002- Mathew. J. Donachie, Stephen. J. Donachie- 2nd edition , ASM International USA

REFERENCE BOOKS:

1. ASM handbook; Vol1: ASM International 1990 Ist edition ASM publication/USA
2. The Super Alloys-Fundamentals and Applications-2006- Roger C Reed.1st edition Cambridge university press, Cambridge, -U K
3. ASM handbook; Vo21: ASM International 1990 Ist edition ASM publication/USA
4. Engineering Materials 2, 2006- 3rd edition, Elsevier publication USA

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

GAS DYNAMICS AND JET PROPULSION

(Professional Elective - IV)

Course Code: A3363

L	T	P	C
4	0	0	4

Course Overview:

This subject deals with the basic fundamentals of compressible flow concepts, non-dimensional numbers in compressible flow and the effect of compressibility in nozzles and diffusers, design criteria of nozzles and diffusers.

This subject is also focus on the effect of friction (Fanno flow) and heat transfer (Rayleigh flow) in compressible flow, the concept of shock waves, its effect and types of shock waves and propulsive methods, concept of air-craft propulsion system. Performance of ram jet, turbojet, turbofan and turbo prop engines.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the basic concepts and property variations of a flow through ducts.
CO2. Determine the performance of different jet propulsion systems.
CO3. Develop governing equations of normal and oblique shocks that encounter in jet propulsion systems.
CO4. Solve problems of different jet propulsion systems.
CO5. Assess functioning, merits and demerits of different jet propulsion systems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

GAS DYNAMICS AND JET PROPULSION

(Professional Elective - IV)

Course Code: A3363

L	T	P	C
4	0	0	4

SYLLABUS

UNIT I

BASIC CONCEPTS AND ISENTROPIC FLOWS CONCEPTS OF GAS DYNAMICS, COMPRESSIBLE FLOWS

Energy and momentum equations of compressible fluid flows – Stagnation states, Mach waves and Mach cone – Effect of Mach number on compressibility – Isentropic flow through variable ducts – Nozzle and Diffusers

UNIT II

FLOW THROUGH DUCTS

Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) – variation of flow properties.

UNIT III

NORMAL AND OBLIQUE SHOCKS

Governing equations – Variation of flow parameters across the normal and oblique shocks – Prandtl – Meyer relations – Applications.

UNIT IV

JET ROPULSION

Working Classification and Performance – Thrust equation – Thrust power and propulsive efficiency, cycle analysis and use of stagnation state performance of turbojet, turbo prop and ramjet engines.

UNIT V

SPACE PROPULSION

Types of rocket engines – Propellants-feeding systems – Ignition and combustion – Theory of rocket propulsion – Performance – Staging – Terminal and characteristic velocity – Applications – space flights.

TEXT BOOKS:

1. Anderson, J.D., “Modern Compressible flow”, 3rd Edition, McGraw Hill, 2003.
2. Yahya, S.M. “Fundamentals of Compressible Flow”, New Age International (P) Limited, New Delhi, 1996.

REFERENCES:

1. Hill. P. and C. Peterson, “Mechanics and Thermodynamics of Propulsion”, Addison – Wesley Publishing company,1992.
2. Zucrow. N.J., “Aircraft and Missile Propulsion”, Vol.1 & II, John Wiley, 1975.
3. Zucrow. N.J., “Principles of Jet Propulsion and Gas Turbines”, John Wiley, New York, 1970.
4. Sutton. G.P., “Rocket Propulsion Elements”, John wiley, New York, 1986,.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

FATIGUE AND FRACTURE MECHANICS

(Professional Elective - IV)

Course Code: A3364

L	T	P	C
4	0	0	4

Course Overview:

This course is an elective, designed for students interested in building knowledge and technical expertise in the principles governing: (1.) design of engineering materials against crack induced fracture in service applications, (2.) diagnosis of cause(s) and mechanisms of failure, and (3.) experimental techniques for characterizing fractures. The course covers the fundamental types of fracture and their characteristic features, fracture modes and theories of fracture mechanics (the efforts of Griffith, Irwin etc will be highlighted). Derivation of fracture mechanics parameters using the energy balance approach and the stress field approach. The conditions for the use of fracture mechanics parameters such as the critical strain energy release rate (G1C), the critical strain energy release rate (K1C), J integral and crack tip opening displacement (CTOD) to establish tendencies to failure of materials will be strongly emphasized. Understanding of the mechanisms of fracture such as fatigue, corrosion fatigue, thermal fatigue, creep, and stress corrosion cracking will also be covered. The use of varied microscopy techniques for fracture studies (fractography) will be studied. The philosophy of performing failure analysis and steps involved in failure analysis investigations will be covered.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Understand the concepts of fatigue and fracture mechanics of structure and emphasize the significance of material properties on the behavior of structures

CO2. Illustrate the critical issues related to the design of machine component.

CO3. Analyze aspects of fatigue behavior based on loading conditions.

CO4. Design of mechanical components against failure.

CO5. Apply the concepts of fracture mechanics to the behavior of cracks in the structures.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

FATIGUE AND FRACTURE MECHANICS

(Professional Elective - IV)

Course Code: A3364

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

FATIGUE OF STRUCTURES: S-N Curves, Endurance limit, Effect of mean stress, Notches and stress concentrations, Neuber's stress concentration factors, Plastic stress concentration factor, Notched S-N curves.

DESIGN OF COMPONENTS: Goodman, Gerber and Soderberg relations and diagrams, Modified Goodman Diagram, Design of components subjected to axial, bending, torsion loads and combination of them.

UNIT - II

STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR: Low cycle and high cycle fatigue, Coffin Manson's relation, Transition life, cyclic strain hardening and softening.

LOAD ASPECTS: Analysis of load histories, Cycle counting techniques, Cumulative damage, Miner's theory, other theories.

UNIT - III

PHYSICAL ASPECTS OF FATIGUE: Phase in fatigue life, Crack initiation, Crack growth, Final fracture, Dislocations, Fatigue fracture surfaces.

FRACTURE MECHANICS PRINCIPLES: Introduction and historical review, Sources of micro and macro cracks. Stress concentration due to elliptical hole, Strength ideal materials, Griffith's energy balance approach. Irwin-Orwin extension of Griffith's theory to ductile materials. Fracture mechanics approach to design.

Safe life and fail safe philosophy.

UNIT - IV

FRACTURE MECHANISMS IN METALS: Ductile Fracture, Clevage, The ductle-Brittle Transition, Intergranular Fracture

FRACTURE MECHANISMS IN NONMETALS: Engineering Plastics, Ceramics and composite materials

UNIT - V

PRACTICAL PROBLEMS: Introduction, through cracks emanating from holes, corner cracks at holes, cracks approaching holes, combined loading, Fatigue crack growth under mixed loading, Biaxial loading.

TEXT BOOKS:

1. DAVID BROEK (1982), Elementary engineering fracture mechanics, Martinus Nihoff Publishers.
2. T.L. Anderson, FRACTURE MECHANICS: Fundamentals and applications, CRC Press Taylor & Francis Group.
3. J. F. Knott (1983), *Fundamentals of Fracture Mechanics*, Butter Worth & Co., Publishers Ltd., London.
4. C. G. Sih (1989) *Mechanics of Fracture*, Vol. I, Sijthoff and Noordhoff International Publishing Co., Netherlands.

REFERENCE BOOKS:

1. W. Barrois, E. L. Ripley (1983), *Fatigue of Aircraft Structures*, Pergamum Pres., Oxford, USA.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

ROBOTICS

(Professional Elective - IV)

Course Code: A3365

L	T	P	C
4	0	0	4

Course Overview:

This course introduces students to the basics, types and elements of robots. The course exposes students to the theoretical concepts of robot kinematics and dynamics as well as the merger of this for implementation. Programming and path planning concepts gives the perception on control of robotics. The concepts on actuators and sensor gives clear understanding and design ability for mobility systems. It gives an overview on application of robotics in manufacturing industry.

Prerequisites (s): Basic knowledge on Linear Algebra, Kinematics and Dynamics.

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the basic concepts and components of a robotic system.
CO2. Compute the forward and inverse kinematics of robots.
CO3. Utilize the key concepts of programming and program the robot path with obstacle avoidance.
CO4. Identify the use of actuators and sensors for robot mobility system.
CO5. Interpret the various applications of robots in Modern Manufacturing Systems.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

ROBOTICS

(Professional Elective - IV)

Course Code: A3365

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

INTRODUCTION: Introduction to Robotics, history of robotics of Robotics, present and future applications – classification by coordinate system and control system.

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, mechanical grippers and gripper faces, Electric, Hydraulic and Pneumatic grippers.

UNIT - II

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation, problems.

MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates, Forward and inverse kinematics, problems.

UNIT - III

MANIPULATOR DYNAMICS - I: Differential transformation of serial manipulators, Jacobians, problems. Dynamics: Lagrange, Euler and Newton, Euler formations, Problems.

MANIPULATOR DYNAMICS - II: Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion, straight line motion, Robot programming, languages and software.

UNIT - IV

ROBOT ACTUATORS AND SENSORS: Actuators: Pneumatic, Hydraulic actuators, electric and stepper motors. sensors position sensors, potentiometers, resolvers, encoders, Velocity sensors.

UNIT - V

ROBOT APPLICATION IN MANUFACTURING: Material Transfer, Material handling, loading and unloading, Processing spot and continuous arc welding & spray painting, Assembly and Inspection.

TEXT BOOKS:

1. M. P. Groover (2010), *Industrial Robotics*, 3rd edition, Pearson Education, New Delhi.
2. K.S. Fu (2010), *Robotics*, 1st edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi.

REFERENCE BOOKS:

1. R.K. Mittal, I. J. Nagrath (2012), *Robotics and Control*, 1st edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
2. P. Coiffet, M. Chaironze (2010), *An Introduction to Robot Technology*, 3rd edition, Kogam Page Ltd., London.
3. Richard D. Klafter(2010), *Robotic Engineering*, 2nd edition, Prentice Hall of India, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

RAPID PROTOTYPING

(Professional Elective - IV)

Course Code: A3366

L	T	P	C
4	0	0	4

Course Overview:

Student will study topics fundamental to rapid prototyping and automated fabrication, including the generation of suitable CAD models, current rapid prototyping fabrication technologies, their underlying material science, the use of secondary processing, and the impact of these technologies on society. The rapid prototyping process will be illustrated by the actual design and fabrication of a part. It can be defined as a group of techniques used to quickly fabricate a scale model of a part or assembly using three- dimensional computer aided design (CAD) data. In addition, RP models can be used for testing, such as when an airfoil shape is put into a wind tunnel.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain product development, conceptual design and classify rapid prototyping systems; stereo lithography process and applications.

CO2. Make use of techniques for processing of CAD models for rapid prototyping.

CO3. Compare the practical issues that are important for the effective use of technologies.

CO4. Apply the concepts of Rapid Prototyping through software.

CO5. Estimate the industrial.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

RAPID PROTOTYPING

(Professional Elective - IV)

Course Code: A3366

L	T	P	C
4	0	0	4

SYLLABUS

UNIT I

INTRODUCTION: History of Rapid Prototyping Need for the compression in Product development Growth of RP Industry, Classification of RP, Stereo lithography(SLA) system & principle, Process parameter, process details of SLA, Data preparation, data files of SLA , Machine details & Application of SLA

UNIT II

SELECTIVE LASER SINTERING (SLS): Introduction, SLS Machine Type – Details, SLS principle of operation, Process parameters of SLS, Data preparation for SLS, Fused Deposition Modeling (FDM) – Introduction, FDM Principles, Process Parameters, Path generation & Application of FDM, Solid Ground curing (SGC) - Principle of operation, SGC machine details & application,

UNIT III

LAMINATE OBJECT MANUFACTURING (LOM): Principle of operation, LOM materials, LOM Process details & Application, Concepts modelers – Principle, Thermal Jet Printer, Sander model maker – Explanation, 3-D Printer, Genesis Printer & HP Systems, Object Qudra system

UNIT IV

RAPID TOOLING –INDIRECT: rapid tooling, Silicon Robber tooling, Aluminum filling epoxy tooling, Spray metal tooling, Direct rapid tooling, Quick cast process, copper Polyamide, DMILS – explanation, Prometals, sand casting tooling, Soft tooling & hard tooling,

UNIT V

STL files, Solid View, Magics, Mimics, Magic communicator, Internet based software, Rapid Manufacturing

– Introduction, Factors influencing accuracy, Data preparation errors, Part building errors, Errors in finishing, Influence of build orientation

TEXT BOOKS:

1. Paul F. Jacobs: "Stereo lithography and other RP & M Technologies", SME, NY 1996.
2. Flham D. T & Dinjoy S.S "Rapid Manufacturing" Verlog London 2001.
3. Rapid automated by Lament wood. Indus press New York

REFERENCE BOOKS:

1. Terry Wohlers "Wohler's Report 2000" Wohler's Association 2000.
2. Rapid prototyping materials by Gurumurthi, IISc Bangalore.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

COMPUTER AIDED DESIGN AND MANUFACTURING LAB

Course Code: A3335

L	T	P	C
0	0	2	1

Course Overview:

Computer Aided Design (CAD) is the use of computer systems to assist in the creation, modification, analysis, or optimization of a design. CAD provides a convenient means to create designs for almost every engineering discipline. Computer-aided manufacturing (CAM) is the use of computer -based software tools that assist engineers and machinists in manufacturing or prototyping product components. Its primary purpose is to create a faster production process and components with more precise dimensions and material consistency, which in some cases, uses only the required amount of raw material (thus minimizing waste), while simultaneously reducing energy consumption. CAM is a programming tool that makes it possible to manufacture physical models using computer-aided design (CAD) programs. CAM creates real life versions of components designed within a software package.

Prerequisite(s):NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Model machine components using Computer Aided Design software.

CO2. Identify parametric modeling techniques to reflect engineering requirements.

CO3. Simulate the static, dynamic and thermal analysis of the components as per the boundary conditions.

CO4. Operate CNC machine to produce machine components.

CO5. Build the NC part program as per the geometry of component.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

COMPUTER AIDED DESIGN AND MANUFACTURING LAB

Course Code: A3335

L	T	P	C
0	0	2	1

LIST OF EXPERIMENTS

1. Development of part drawings for various components in the form of orthographic and isometric.
2. Generation of various 3D Models through Protrusion, revolve, shell sweep Creation of various features.
3. Feature based and Boolean based modeling surface and Assembly Modeling.
4. Stress analysis of a plate with a circular hole.
5. Stress analysis of beams (Cantilever, Simply supported, Fixed ends)
6. Stress analysis of an axi-symmetric component
7. Thermal stress analysis of a 2D component
8. Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)
9. Part programming for Turning, Facing, Chamfering, Grooving,
10. Part programming for Step turning, Taper turning, Circular interpolation, Combination of few operations on CNC lathe
11. Part programming for Point to point motions, Line motions, Circular interpolation, Contour motion,
12. Part programming for Pocket milling- circular, rectangular, Mirror commands.
13. Part Programming uses Fixed or Canned Cycles for Drilling, Boring, Taper turning, Thread cutting.
14. Machining of small components using CNC LATHE & CNC MILLING MACHINE.

Any Four Software Packages from the following:

AUTOCAD, CATIA, Pro-E, I-DEAS, ANSYS, CNC Train, GIBBS CAM

Note: (Minimum 12 Experiments to be conducted)

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

PRODUCTION DRAWING PRACTICE AND INSTRUMENTATION LAB

Course Code: A3336

L	T	P	C
0	0	2	1

Course Overview:

This course covers the terminology, concepts, principles and computations used by engineers and technicians to specify, analysis and maintain instrumentation and control systems. It emphasizes practices in industry concepts, so that students learn what aspects of plant design and control are critical. Practical examples have been used for many common pressure, level, temperature and flow measuring systems. Approaches are presented for measurement selection, process/modification, and control structure design.

Prerequisite (s): Engineering mechanics, Fluid mechanics

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Choose suitable fits and associated tolerance for machine elements.
CO2. Develop detailed part drawings from assembly drawings of machine components.
CO3. Calibrate pressure, temperature, strain, speed, and angle by measuring instruments.
CO4. Justify the appropriate device for the measurement of parameters like temperature, pressure, speed, strain etc.
CO5. Represent materials, screw joints, welded joints, and gears conventionally.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VII Semester **VCE-R15**

PRODUCTION DRAWING PRACTICE AND INTRUMENTATION LAB

Course Code: A3336

L	T	P	C
0	0	2	1

LIST OF EXPERIMENTS

PART - A

PRODUCTION DRAWING:

UNIT - I

Conventional representation of Materials, conventional representation of parts, screw joints, welded joints, springs, gears, electrical, hydraulic and pneumatic circuits, methods of indicating notes on drawings.

UNIT - II

LIMITS AND FITS: Types of fits, exercises involving selection / interpretation of fits and estimation of limits from tables.

FORM AND POSITIONAL TOLERANCES: Introduction and indication of the tolerances of form and position on drawings, deformation of runout and total runout and their indication.

UNIT - III

SURFACE ROUGHNESS AND ITS INDICATION: Definitions, finishes obtainable from various manufacturing processes, recommended surface roughness on mechanical components.

UNIT - IV

Heat treatment and surface treatment symbols used in drawings.

UNIT - V

DETAILED AND PART DRAWINGS: Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

TEXT BOOKS:

1. K. L. Narayana, P. Kannaiah (2012), *Production and Drawing*, New Age International Publications, New Delhi, India.
2. Pohit, Ghosh, (2012), *Machine Drawing with Auto CAD*, Pearson Education, New Delhi, India.

REFERENCE BOOKS:

1. James D. Meadows (2008), *Geometric dimensioning and tolerance*, B.S Publications, Chennai, India.
2. R. K. Jain (2009), *Engineering Metrology*, Khanna Publications, New Delhi, India.

PART - B INSTRUMENTATION LAB

LIST OF EXPERIMENTS:

1. Calibration of Pressure Gauges
2. Study and calibration of LVDT transducer for displacement measurement.
3. Calibration of strain gauge for temperature measurement.
4. Calibration of thermocouple for temperature measurement.
5. Calibration of capacitive transducer for angular displacement.
6. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
7. Calibration of resistance temperature detector for temperature measurement.
8. Study and calibration of a Rota meter for flow measurement.

Note: (Minimum 06 Experiments to be conducted)

SYLLABI FOR
VIII SEMESTER

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

REFRIGERATION AND AIR-CONDITIONING

Course Code: A3337

L	T	P	C
3	1	0	3

Course Overview:

Systematic approach to study the basic concepts of refrigeration and air-conditioning and its applications. This course consists the types of refrigeration systems like air refrigeration system, vapour compression refrigeration system, vapour absorption system, steam jet refrigeration system, thermo-electric refrigeration system, vortex tube and comparison among various refrigeration systems. It will be useful to study the types of refrigerants and components of various refrigeration systems. Air-Conditioning focuses on its basic concepts and types of air conditioning systems, various components used in air-conditioning system. It describes the concept of effective temperature, comfort chart and heat pump circuits.

Prerequisite (s): Thermodynamics, Thermal Engineering-I, Thermal Engineering-II.

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Explain the basic concepts and working of various refrigeration and air-conditioning systems.
CO2. Compare the performance of different refrigeration and air conditioning systems.
CO3. Solve problems of different refrigeration and air conditioning systems.
CO4. Assess merits and demerits of different refrigeration and air conditioning systems.
CO5. Classify the refrigerants based on environmental considerations.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

REFRIGERATION AND AIR-CONDITIONING

Course Code: A3337

L	T	P	C
3	1	0	3

SYLLABUS

UNIT - I

INTRODUCTION TO REFRIGERATION: Necessity and applications, Unit of refrigeration and C.O.P, Mechanical Refrigeration , Types of Ideal cycles of refrigeration. Air Refrigeration: Bell Coleman cycle and Brayton Cycle, Open and Dense air systems, Actual air refrigeration system problems, and Refrigeration needs of Air craft's.

UNIT - II

VAPOUR COMPRESSION REFRIGERATION SYSTEMS: Working principle and essential components of the plant , simple vapour compression refrigeration cycle, COP, Representation of cycle on T-S and p-h charts, effect of sub cooling and super heating , Cycle analysis, Actual cycle, Influence of various parameters on system performance, Use of p-h charts, numerical Problems.

VAPOUR ABSORPTION SYSTEMS: Calculation of COP, description and working of NH_3-water system and LiBr-water (Two shell & Four shell) System. Principle of operation Three Fluid absorption system, salient features.

UNIT - III

SYSTEM COMPONENTS: Evaporators, classification, Working Principles, Expansion devices, Types, Working Principles.

REFRIGERANTS: Desirable properties, classification, refrigerants Nomenclature, Ozone Depletion, and Global Warming.

STEAM JET REFRIGERATION SYSTEM: Working Principle and Basic Components, Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

UNIT - IV

INTRODUCTION TO AIR CONDITIONING: Psychometric Properties & Processes, Characterization of Sensible and latent heat loads, Need for Ventilation, Consideration of Infiltration, Load concepts of RSHF, GSHF- Problems, Concept of ESHF and ADP.

UNIT – V

COMFORT AIR CONDITIONING: Requirements of human comfort and concept of effective temperature-Comfort chart, Comfort Air conditioning, Requirements of Industrial air conditioning.

AIR CONDITIONING SYSTEM-Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, fans and blowers, Heat Pump, Heat sources, Different heat pump circuits.

TEXT BOOKS:

1. Domkundwar, S. C. Arora (2009), *A Course in Refrigeration and Air conditioning*, 6th edition, Dhanpatrai Publications, New Delhi, India.
2. C.P. Arora(2009), *Refrigeration and Air Conditioning,* 3rd edition, Tata McGraw-Hill education (P) Ltd, New Delhi, India.

REFERENCE BOOKS:

1. Manohar Prasad(2010), *Refrigeration and Air Conditioning*, Revised 2nd edition, New Age International Pvt. Ltd., New Delhi, India.
2. S. S. Thipse(2005), *Refrigeration and Air Conditioning,* 1st edition, Jaico Publishing House, Mumbai, India.
3. Ananthanarayanan(2009), *Basic Refrigeration and Air Conditioning,* 3rd edition, Tata McGraw Hill, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

COMPUTATIONAL FLUID DYNAMICS

(Professional Elective - V)

Course Code: A3367

L	T	P	C
3	0	0	3

Course Overview:

Fluid dynamics is the science of fluid motion. This course provides core knowledge of the fundamentals of CFD for engineers, and an introduction to the methods and analysis techniques used in CFD. It also provides an introduction to the use of commercial CFD codes to analyze flow and heat transfer in problems of practical engineering interest. At the end of the course the learners will understand the process of developing a geometrical model of the flow, applying appropriate boundary conditions, specifying solution parameters, and visualising and analysing the results. Through the course study, the learners will also become conscious of the limitations of CFD and develop an appreciation for the factors limiting the accuracy of CFD solutions.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Identify the governing differential equations and apply the boundary conditions for fluid dynamics problems.

CO2. Explain discretization techniques and error analysis for stability.

CO3. Apply general transformation equations for grid generations.

CO4. Develop algorithms for flow field analysis.

CO5. Analyze turbulence models for different Reynolds numbers.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

COMPUTATIONAL FLUID DYNAMICS

(Professional Elective - V)

Course Code: A3367

L	T	P	C
3	0	0	3

SYLLABUS

UNIT - I

INTRODUCTION: CFD, what, when, and applications Methods to solve a physical problem , Numerical Methods , Brief comparison between FDM, FEM & FVM ,Applied Numerical Methods. Solution of a system of simultaneous Linear Algebraic Equations, Iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for baned matrices. Finite Difference Applications in Heat conduction and Convention , Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT - II

FINITE DIFFERENCES: Discretization, consistency, stability, and Fundamentals of fluid flow modeling. Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

UNIT - III

ERRORS AND STABILITY ANALYSIS: introduction, first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

REVIEW OF EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER: Introduction, Conservation of mass Newton's second law of motion, expanded forms of Navier-strokes equations, conservation of energy principle, special forms of the Navier , stokes equations.

UNIT - IV

STEADY FLOW: dimensions form of Momentum and Energy equations, Stokes equation, and conservative body force fields, stream function, Vorticity formulation, Boundary, layer theory, Buoyancy, Driven Convection and stability.

UNIT - V

SIMPLE CFD TECHNIQUES: viscous flows conservation form space marching, relovation techniques, viscous flows, conservation from space marching relovation techniques, artificial viscosity, the alternating direction implicit techniques, pressure correction technique, computer graphic techniques used in CFD. Quasi one dimensional flow through a nozzle, turbulence models, standard and high Reynolds number models and their applications.

TEXT BOOKS:

1. J Chung (2010), *Computational Fluid Dynamics*, 2nd edition, Cambridge University Press, India.
2. John .D. Anderson (2010), *Computational Fluid Dynamics*, 3rd edition, McGraw- Hill International Edition, India.
3. Numerical S.V. Patankar Heat Trasnfer and Fluid Flow Magraw Hill

REFERENCE BOOKS:

1. Ronnie Anderson (2012*), Computational Fluid Dynamics for Engineers,* 2nd edition, Cambridge University Press, India.
2. Jean-Jacques Chattot (2010), *Computational aerodynamics and fluid dynamics an introduction,* 3rd edition, Springer, Germany.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

VIBRATIONS AND STRUCTURAL DYNAMICS

(Professional Elective - V)

Course Code: A3368

L	T	P	C
4	0	0	4

Course Overview:

The objective of this course is to make students to gain basic knowledge and overview of Vibrations of the systems. The knowledge of Mechanical vibrations enables them to design, analysis various mechanical systems. Vibration response of the systems can be evaluated by applying numerical methods to various physical systems.

Prerequisite (s): Mathematics, Engineering Mechanics, Mechanics of Solids

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Formulate the mathematical models and develop the equation of motion of vibrating systems by different principles.

CO2. Advance the essential information, skills and competencies to evaluate and resolve vibration problems across a wide range of applications.

CO3. Articulate the basic concepts of mechanical vibrations and justify their application in a variety of engineering design contexts.

CO4. Discuss the influences of factors on the dynamic behavior of structures.

CO5. Analyze the structures and machines by considering the economic, industry, human and environment.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

VIBRATIONS AND STRUCTURAL DYNAMICS

(Professional Elective - IV)

Course Code: A3368

L	T	P	C
4	0	0	4

SYLLABUS

UNIT I:

INTRODUCTION- SINGLE DEGREE OF FREEDOM SYSTEMS: Simple harmonic motion, terminology. Degrees of freedom. Free vibrations and forced vibrations- examples of single degree of freedom mechanical vibrations, equation of motion. Spring, inertia, damping elements. Undamped natural frequency, damped natural frequency, damping ratio. Mechanisms of damping. Equivalent viscous damping. Forced vibrations. Examples. Resonance. Vibration measuring instruments. Amplitude and Phase response diagrams. D'Alembert's principle- inertial force.

UNIT II

VIBRATION OF DISCRETE SYSTEMS: Two / Three degree of freedom systems. Static and dynamic coupling. Examples. Principal coordinates, principal modes- orthogonality conditions. Extension to multiple degrees of freedom systems. Vibration absorbers.

VIBRATION OF CONTINUOUS SYSTEMS: Introduction to Hamilton's Principle. Longintudinal, transverse and torsional vibration of cylindrical shafts- extension to tapered shafts. Dynamical equations of equilibria of general elastic bodies.

UNIT III

DETERMINATION OF NATURAL FREQUENCIES AND MODE SHAPES: Natural vibrations of solid continua. Methods of determining natural frequencies and mode shapes.

ROTATING SHAFTS: Natural frequency of rotating shafts. Whirling of shafts. Dynamic balancing of rotating machinery. Dynamic dampers.

UNIT IV

MATRIX METHODS: Matrices for dynamic analysis. Kinematically consistent load systems and determination of [K], [M], [C] and [L] matrices. Normalization and formulation of modal equations.

APPROXIMATE METHODS OF VIBRATION ANALYSIS: Introduction to approximate methods for frequency analysis. Rayleigh Ritz method for vibration analysis. Diagonalization of stiffness, mass and damping matrices using orthogonality conditions.

UNIT V

INTRODUCTION TO STRUCTURAL DYNAMICS: Steady state response, using Fourier analysis for decomposing complex periodic load functions of modal equations using S-plane representation. Transient response analysis of modal equations using Duhamel's integrals.

TEXT BOOKS

1. R.W. Clough and Penzien, *Dynamics of Structures.*
2. Rao, Singiresu S. *Mechanical Vibrations*, Pearson Education LPE-2004.
3. Rao, J.S and Gupta .K., *Theory and practice of Mechanical Vibrations*, Wiley Eastern Ltd., New Delhi, 2002.

REFERENCES

1. Harris & Creed, *Shock and Vibrations,* third edition, McGraw-Hill Book Company.
2. Singh, V.P., *Mechanical Vibrations,* Dhanapati Rai and Co. 2003 edition.
3. Grahamkelly, S., *Mechanical Vibrations,* TMH 2004 edition.
4. Groover, G.K., *Mechanical Vibrations*, Nemchand and Brothers 2001 edition. 8. *Vibrations and Waves MIT series 1987,* CBS Publishers and Distributors
5. Fug, Y.C., An Introduction to Theory of Aeroelasticity, John Wiley & Sons, NewYork,1984
6. Shock and Vibrations by Harris & Creed Mc-Graw Hill book company, third edition

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

MICRO ELECTRO MECHANICAL SYSTEMS

(Professional Elective - IV)

Course Code: A3369

L	T	P	C
4	0	0	4

Course Overview:

The objective of this course is to make students to gain basic knowledge on overview of MEMS (Micro electro Mechanical System) and various fabrication techniques. This enables them to design, analysis, fabrication and testing the MEMS based components. And to introduce the students various opportunities in the emerging field of MEMS.

Prerequisite (s): Basic knowledge in material science, Design, Electronic circuits

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Identify the governing differential equations and apply the boundary conditions for fluid dynamics problems.

Co2. Explain discretization techniques and error analysis for stability.

Co3. Apply general transformation equations for grid generations.

Co4. Develop algorithms for flow field analysis.

Co5. Analyze turbulence models for different Reynolds numbers.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

MICRO ELECTRO MECHANICAL SYSTEMS

(Professional Elective - V)

Course Code: A3369

L	T	P	C
4	0	0	4

SYLLABUS

UNIT – I

INTRODUCTION: Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micromachining, wafer bonding, LIGA.

MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

UNIT – II

THERMAL SENSORS AND ACTUATORS: Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

UNIT – III

MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS: Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

UNIT – IV

MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive Mechanical Engineering sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe based storage device.

UNIT – V

MICRO FLUIDIC SYSTEMS: Applications, considerations on micro scale fluid, fluid actuation methods, dielectro phoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, optoelectro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps.

RADIO FREQUENCY (RF) MEMS: RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

TEXT BOOKS:

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2012.
2. Stephen D Senturia, 'Microsystem Design', Springer Publication, 2000.
3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.
4. MEMS, Nitaigour Premchand Mahalik, TMH Publishing co.

REFERENCES:

1. Nadim Maluf," An Introduction to Micro Electro Mechanical System Design", Artech House, 2000
2. Mohamed Gad-el-Hak, editor, " The MEMS Handbook", CRC press Baco Raton, 2001.
3. Julian W. Gardner, Vijay K. Varadan, Osama O.Awadelkarim, Micro Sensors MEMS and Smart Devices, John Wiley & Son LTD, 2002.
4. James J. Allen, Micro Electro Mechanical System Design, CRC Press Publisher, 2005.
5. Thomas M.Adams and Richard A.Layton, "Introduction MEMS, Fabrication and Application," Springer, 2010.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

MECHATRONICS

(Professional Elective - V)

Course Code: A3370

L	T	P	C
4	0	0	4

Course Overview:

This course is an introduction to designing mechatronic systems, which require integration of the mechanical and electrical engineering disciplines within a unified framework. There are significant laboratory-based design experiences. Topics covered in the course include: Low-level interfacing of software with hardware; use of high-level graphical programming tools to implement real-time computation tasks; digital logic; analog interfacing and power amplifiers; measurement and sensing; electromagnetic and optical transducers; control of mechatronic systems.

Prerequisite (s): Instrumentation and control systems

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Describe the precision actuation systems, signal conditioning, electro mechanical drives and electronic interface systems.

CO2. Analyze the precision actuation systems, signal conditioning, electro mechanical drives and electronic interface systems.

CO3. Analyze the performance of devices using microcontrollers.

CO4. Develop the mechanical systems using the micro controllers and programmable logic controllers

CO5. Design a system, component, or process to meet desired needs within realistic constraints.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

MECHATRONICS

(Professional Elective - V)

Course Code: A3370

L	T	P	C
4	0	0	4

SYLLABUS

UNIT - I

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

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 - II

SIGNAL CONDITIONING : Introduction , Hardware ,Digital I/O , Analog input , ADC , resolution , sped 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

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

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 - IV

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

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 - V

PROGRAMMABLE MOTION CONTROLLERS : Introduction, 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.

TEXT BOOKS:

1. W. Bolton (2012), *Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering*, 4th edition, Pearson Education, New Delhi, India.
2. N. Shanmugam (2010), *Mechatronics,* 2nd edition, Anuradha Agencies Publishers, Chennai, India.
3. R. K. Rajput (2012), *a text book of Mechatronics,* 1st edition, S. Chand & Company Ltd., New Delhi, India.

REFERENCE BOOKS:

1. Bradley (2010), *Mechatronics*, 4th edition, prentice Hall of India, New Delhi, India.
2. HMT. Ltd (1998), *Mechatronics,* 1st edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi, India.
3. M. D. Singh, J. G. Joshi (2011), *Mechatronics,* 1st edition, Prentice Hall of India Pvt Ltd., New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS

(Open Elective)

Course Code: A3576

L	T	P	C
3	0	0	3

Course Overview:

This course introduces to understand techniques to the design the database systems. This course consists of E-R modeling, data definition and manipulation languages, database security and administration. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery and various types of database and uses Indexing concepts for faster retrieval of data in database.

Prerequisite (s): Object oriented Programming Discrete Mathematical Structures

Course Outcomes:

Upon successful completion of this course, student will be able to:

Upon successful completion of this course, student will be able to:

CO1. The benefits of DBMS feature when compared with File Systems.

CO2. Analyze the working principle of DBMS using relational algebra, relational calculus and converting into RDBMS.

CO3. Demonstrate an understanding RDBMS with the help of SQL tool.

CO4. The use of normalization theory and apply such knowledge to the normalization of a database for efficient use.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS

(Open Elective)

Course Code: A3576

L	T	P	C
3	0	0	3

SYLLABUS

UNIT – I **(13 Lectures)**

INTRODUCTION: History of database systems, introduction to database management systems, database system applications, database systems versus file systems, view of data, data models, database languages- DDL & DML commands and examples of basic SQL queries, database users and administrators, transaction management.(T2: Ch-1)

DATABASE DESIGN: Introduction to database design and E-R diagrams, entities, attributes and entity sets, relationships and relationship sets, conceptual design for large enterprises. (T1: Ch-2)

UNIT – II **(13 Lectures)**

THE RELATIONAL MODEL: Introduction to the relational model, integrity constraints over relations, enforcing integrity constraints, querying relational data.(T1: Ch-3)

RELATIONAL ALGEBRA AND CALCULUS: Preliminaries, relational algebra operators, relational calculus - tuple and domain relational calculus. (T1: Ch-4)

SQL: Overview, the form of a basic SQL query, union, intersect and except operators, nested queries, aggregate operators, null values, complex integrity constraints in SQL, cursors, triggers (T1: Ch-5)

UNIT – III **(9 Lectures)**

SCHEMA REFINEMENT AND NORMAL FORMS: Functional dependencies, reasoning about FDs. Normal forms: 1NF, 2NF, 3NF, BCNF, properties of decompositions, normalization, schema refinement in database design, other kinds of dependencies: 4NF, 5NF.(T1: Ch-19)

UNIT – IV **(10 Lectures)**

TRANSACTIONS MANAGEMENT: Transaction concept, transaction state, implementation of atomicity and durability, concurrent executions, Anomalies due to interleaved execution of transactions, serializability, recoverability.(T2: Ch-14)

CONCURRENCY CONTROL AND RECOVERY SYSTEM: Concurrency control - lock based protocols, time-stamp based protocols, validation based protocols, deadlock handling.(T2: Ch-16)

UNIT – V **(8 Lectures)**

OVERVIEW OF STORAGE AND INDEXING: RAID levels, Index data structures, Tree structured indexing - intuition for tree indexes, indexed sequential access method (ISAM), B+ Trees - a dynamic tree structure.(T1: Ch-9,10)

TEXT BOOK(S):

1. Raghurama Krishnan, Johannes Gehrke (2007), *Database Management Systems*, 3rd Edition, Tata McGraw-Hill, New Delhi, India.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan (2010), *Database System Concepts,* 6th Edition, McGraw- Hill, New Delhi, India.

REFERENCE BOOK(S):

1. Elmasri Navate (2014), *Fundamentals of Database Systems*, Pearson Education, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

FUNDAMENTALS OF IMAGE PROCESSING

(Open Elective)

Course Code: A3577

L	T	P	C
3	0	0	3

Course Overview:

Visual information plays an important role in many aspects of our life. Much of this information is represented by digital images and videos. Extracting such information from the digital images and videos has numerous applications in computer vision, robotics, remote sensing, medical imaging, etc. This course gives the students the ability to understand and apply the principles of digital image processing and pattern recognition and develop some applications by following the team based learning principles.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Have an appreciation of the fundamentals of Digital image processing and pattern recognition including the topics such as filtering, transforms and morphology, and image analysis, compression and clustering.

CO2. Be able to understand and use basic image processing algorithms.

CO3. Have the skill base necessary to further explore advanced topics of Digital Image Processing and pattern recognition.

CO4. Be in a position to make a positive professional contribution in the field of Digital Image Processing and pattern recognition

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

FUNDAMENTALS OF IMAGE PROCESSING

(Open Elective)

Course Code: A3577

L	T	P	C
3	0	0	3

SYLLABUS

UNIT - I **(Lectures 10)**

FUNDAMENTALS OF IMAGE PROCESSING:

Image acquisition, image model, sampling, quantization, relationship between pixels, distance measures, connectivity, and image geometry.**(Chapter1: T1)**

UNIT – II **(Lectures8)**

IMAGE TRANSFORMS:

Fourier transform, DFT, DFT-properties , FFT, WALSH transform, HADAMARD transform, DCT. **(chapter2: T1,R2)**

UNIT – III **(Lectures11)**

IMAGE ENHANCEMENT (SPATIAL Domain Methods):

Histogram Processing - definition, equalization, matching, local enhancement, use of histogram statics for image enhancement, Arithmetic and logical operations, pixel or point operations, size operations, Smoothing filters-mean, median, mode filters, sharpening spatial filtering. **(chapter3: T1)**

UNIT – IV **(Lectures 9)**

IMAGE ENHANCEMENT (FREQUENCY Domain Methods):

Design of low pass, high pass, edge enhancement, smoothening filters in frequency domain. Butter worth filter, sharpening frequency domain filters, homomorphic filters in frequency domain. **(chapter4: T1,R1)**

UNIT – V **(Lectures13)**

IMAGE SEGMENTATION:

Detection of discontinuities, edge linking and boundary detection, thresholding, region based segmentation, use of motion in segmentation. **(Chapter5: T1)**

COLOR IMAGE PROCESSING:

Fundamentals, models, pseudo color image, color transformation, Fundamentals of image compression, image compression models and color image compression.**(Chapter5: T1,R1)**

TEXT BOOKS:

1. T1: Rafael C. Gonzalez, Richard E. Woods (2008), Digital Image Processing, Low Price Edition, Pearson Education, New Delhi, India.

REFERENCE BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Second Edition, Prentice Hall.
2. Fundamentals of digital image processing by Anil K. jain, Low Price Edition, Pearson Education.
3. Arthur R. Weeks (1996),Fundamentals of Electronic Image Processing, Prentice Hall of India, New Delhi.
4. Milan Sonka, Vaclav Hlavac, Roger Boyle (2008), Image processing, Analysis and Machine vision, Thomson Publications, India.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

OPERATING SYSTEM FUNDAMENTALS

(Open Elective)

Course Code: A3578

L	T	P	C
3	0	0	3

Course Overview:

Operating Systems Course is intended as a general introduction to the services provided by it. The course will give idea of various Operating system structures and types. The topics include process management and synchronization, handling of deadlocks, memory and storage management. The course also provides how Input-Output communicates with the system. The file, directory and disk management information can be understood. It compares different operating systems how they manage resources and services. Provides basic information related to protection and security.

Prerequisite(s): NIL

Course Outcomes:

Upon successful completion of this course, student will be able to:

CO1. Understand the operation of process management, memory management, storage management and system calls & system programs. Demonstrate knowledge process management.

CO2. Apply and implement process concepts, process synchronization, semaphores, readers & writers problem and dining philosopher problem.

CO3. Evaluate and implement deadlock avoidance, deadlock detection and deadlock recovery mechanisms and Analyze and implement memory management schemes.

CO4. Apply and create file system concepts for file access, directory access methods, disk storage and disk scheduling algorithms.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

OPERATING SYSTEM FUNDAMENTALS

(Open Elective)

Course Code: A3578

L	T	P	C
3	0	0	3

SYLLABUS

UNIT – I **(11 Lectures)**

OPERATING SYSTEMS OVERVIEW: Introduction-operating system operations, process management, memory management, storage management, protection and security, System structures-Operating system services, systems calls, Types of system calls, system programs (**T1: Ch-1, 2**)

UNIT – II **(12 Lectures)**

PROCESS MANAGEMENT: Process concepts- Operations on processes, IPC, Process Scheduling (**T1: Ch-3, 5).**

PROCESS COORDINATION: Process synchronization- critical section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of synchronization, readers and writers problem, dining philosopher's problem, monitors **(T1: Ch-6**).

UNIT – III **(11 Lectures)**

DEADLOCKS: System model, deadlock characterization, deadlock prevention, avoidance, detection and recovery from deadlock. **(T1: Ch-7**)

MEMORY MANAGEMENT: Memory management strategies-Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, virtual-memory management- demand paging, page-replacement algorithms, allocation of frames, thrashing. (**T1: Ch-8, 9**)

UNIT – IV **(10 Lectures)**

STORAGE MANAGEMENT: File system-Concept of a file, access methods, directory structure, file system mounting, file sharing, protection. (**T1: Ch-10**)

SECONDARY-STORAGE STRUCTURE: Overview of mass storage structure, disk structure, disk attachment, disk scheduling algorithms, swap space management, stable storage implementation, and tertiary storage structure (**T1: Ch-12**).

UNIT – V **(11 Lectures)**

PROTECTION: System protection-Goals of protection, principles of protection, domain of protection access matrix, implementation of access matrix, access control, revocation of access rights. (**T1: Ch-13**)

SECURITY: System security-The security problem, program threats, system and network threats, implementing security defenses, firewalling to protect systems (**T1: Ch -18**).

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2009), Operating System Concepts, 8th Edition, Wiley India Private Limited, New Delhi.

REFERENCE BOOKS:

1. Stallings (2006), Operating Systems, Internals and Design Principles, 5th Edition, Pearson Education, India.
2. Andrew S. Tanenbaum (2007), Modern Operating Systems, 2nd Edition, Prentice Hall of India, India.
3. Deitel & Deitel (2008), Operating systems, 3rd Edition, Pearson Education, India.
4. Dhamdhere (2008), Operating Systems, 2nd Edition, Tata Mc graw Hill, New Delhi.
5. Paul Love, Joe Merlino, Craig Zimmerman, Jeremy C. Reed, and Paul Weinstein (2005), Beginning Unix, Wiley Publishing, Inc.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

JAVA PROGRAMMING

(Open Elective)

Course Code: A3579

L	T	P	C
3	0	0	3

Course Overview:

The Course provides a comprehensive coverage of conceptual and practical Java language, describing its syntax, keywords, and fundamental programming principles to become a proficient Java Programmer. The course is divided into five units, each focusing on a different aspect of core Java Environment suitable to write efficient, maintainable, and portable code. At the outset, the course ignites Object Oriented thinking and explores with the evolution of Java and its basics. It gives strong foundation on Inheritance, Packages and Interfaces and also discusses Exception Handling and Multithreaded mechanisms. The course examines java concepts such as Applets and Event handling. The course end up with nourishing AWT Controls and Swing concepts used for GUI applications. Overall, the knowledge of this course is essential to learn advanced Java and other OOP based languages and hence, stands as a pre-requisite for few fore coming courses like Struts and Spring Framework, Hibernate Framework. The course also plays a vital role in building front-end applications for Mini and Major Project Works in the final year.

Prerequisite(s): Data Structures (A3503)

Course Outcomes:

Upon completion of this course, students will be able to:

Upon successful completion of this course, student will be able to:

CO1. Understand the operation of process management, memory management, storage management and system calls & system programs. Demonstrate knowledge process management.

CO2. Apply and implement process concepts, process synchronization, semaphores, readers & writers problem and dining philosopher problem.

CO3. Evaluate and implement deadlock avoidance, deadlock detection and deadlock recovery mechanisms and Analyze and implement memory management schemes.

CO4. Apply and create file system concepts for file access, directory access methods, disk storage and disk scheduling algorithms.

VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

B. Tech. ME VIII Semester **VCE-R15**

JAVA PROGRAMMING

(Open Elective)

Course Code: A3579

L	T	P	C
3	0	0	3

SYLLABUS

UNIT – I **(15 Lectures)**

EVOLUTION OF JAVA: Object-Oriented Programming Introduction, Two Paradigms, The Three OOP Principles, Evolution of Java, Java Buzzwords, Java Program Structure, Implementing a Java Program, JVM Architecture, Data Types, Variables, Constants, Type Conversion and Casting, I/O Basics, Operators, and Control Statements.

CLASS, METHODS, OBJECTS AND CONSTRUCTORS: Introducing Classes, Objects, Methods, Constructors, Garbage Collection, finalize, Overloading Methods and Constructors, Argument Passing, Recursion, static and final Keywords.

ARRAYS: One dimensional and two dimensional arrays with sample examples.

STRINGS: Exploring String and String Buffer class and Methods.

UNIT – II **(10 Lectures)**

INHERITANCE: Inheritance Basics, Member Access and Inheritance, this and super Keywords, Creating Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Abstract Classes ,inheritance with final keyword.

PACKAGES AND INTERFACES: Defining a Package, Finding Packages and CLASSPATH, Access Protection, Importing Packages, Defining an Interface, and Implementing Interfaces.

UNIT – III **(10 Lectures)**

EXCEPTION HANDLING: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try, catch, throw, throws and finally Keywords, Built-in Exceptions, Creating Own Exception.

MULTITHREADED PROGRAMMING: Thread Life Cycle, Creating a Thread - Extending Thread Class and Implementing Runnable Interface, Creating Multiple Threads**,** Thread Priorities, Synchronization.

UNIT – IV **(10 Lectures)**

AWT CONTROLS: AWT Classes, Window Fundamentals, Working with Frame Windows, Working with Graphics, Color, Fonts, Control Fundamentals, Labels, Buttons, Check Boxes, Checkbox Group, Choice Controls, Lists, Scroll Bars, Text Area, and Layout Managers.

SWINGS: Swings Introduction, Features, Hierarchy of Swing, Top Level Containers - JFrame, JWindow, JApplet, Light Weight Containers - JPanel, Create a Swing Applet, Swing Components - JLabel and Image Icon, JText Field, JButton, JCheckBox, JRadio Button, and JCombo Box.

EVENT HANDLING: Delegation Event Model, Event Classes, Sources of Events, Event Listener Interfaces, Handling Mouse and Keyboard Events, Adapter Classes.

UNIT – V **(10 Lectures)**

FILE I/O: Streams, Stream Classes- Byte and Character, File Operations – Reading, Writing and Closing,

EXPLORING JAVA.UTIL: Array List, Vector, Hash table, String Tokenizer, and Date.

APPLETS: Applet Basics, Applet Lifecycle, Applet Skeleton, Simple Applet Display Methods, the HTML APPLET Tag, Passing Parameters to Applets.

TEXT BOOK:

1. Herbert Schildt (2011), *Java: The Complete Reference*, 8th Edition, Tata McGraw-Hill Education, New Delhi.

REFERENCE BOOKS:

1. Michael Ernest (2013), *Java SE 7 Programming Essentials*, John Wiley & Sons Inc.
2. Y. Daniel Liang (2014), *Introduction to Java Programming, Comprehensive Version*, 10th Edition, Pearson Education, India.
3. Kathy Sierra, Bert Bates (2014), *OCA/OCP Java SE 7 Programmer I & II Study Guide* (Exams 1Z0-803 & 1Z0-804), 1st Edition, McGraw-Hill Education Publisher, USA.

Frequently asked Questions and Answers about autonomy

1. Who grants Autonomy? UGC, Govt., AICTE or University

In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the UGC that finally grants autonomy.

2. Shall VCE award its own Degrees?

No. Degree will be awarded by Jawaharlal Nehru Technological University Hyderabad with a mention of the name Vardhaman College of Engineering on the Degree Certificate.

3. What is the difference between a Deemed to be University and an Autonomy College?

A Deemed to be University is fully autonomous to the extent of awarding its own Degree. A Deemed to be University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

4. How will the Foreign Universities or other stake–holders know that we are an Autonomous College?

Autonomous status, once declared, shall be accepted by all the stake holders. Foreign Universities and Indian Industries will know our status through our college website.

5. What is the change of Status for Students and Teachers if we become Autonomous?

An autonomous college carries a prestigious image. Autonomy is actually earned out of continued past efforts on academic performance, capability of self-governance and the kind of quality education we offer.

6. Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?

There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee is a Non–Statutory body, which will keep an eye on the academics and keep its reports and recommendations every year. In addition to the Academic Council, the highest academic body also supervises the academic matters. At the end of three years, there is an external inspection by the University for this purpose. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration, and such other parameters are involved in this process.

7. Will the students of VCE as an Autonomous College qualify for University Medals and Prizes for academic excellence?

No. VCE has instituted its own awards, medals, etc. for the academic performance of the students. However, for all other events like sports, cultural and co-curricular organized by the University the students shall qualify.

8. Can VCE have its own Convocation?

No, since the University awards the Degree the Convocation will be that of the University.

9. Can VCE give a provisional Degree certificate?

Since the examinations are conducted by VCE and the results are also declared by VCE, the college sends a list of successful students with their final grades of marks to the University. Therefore, with the prior permission of the University the college will be entitled to give the Provisional Certificate.

10. Will Academic Autonomy make a positive impact on the Placements or Employability?

Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment, besides the autonomous status is more responsive to the needs of the industry. As a result, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

11. What is the proportion of Internal and External Assessment as an Autonomous College?

Presently, it is 25 % for internal assessment and 75 % for external assessment. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

12. Will there be any Revaluation or Re-Examination System?

Students shall be permitted for re-evaluation after the declaration of end semester examination results within a stipulated period by paying prescribed fee. But there will not be any re-examination system.

13. How fast Syllabi can be and should be changed?

Autonomy allows us the freedom to change the syllabi as often as we need.

14. Will the Degree be awarded on the basis of only final year performance?

No. The grades will reflect the average performance of all the semesters put together in CGPA format.

15. Who takes Decisions on Academic matters?

The Academic Council of College is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like the BOS which are like Boards of Studies of the University.

16. What is the role of Examination committee?

The Exam Committee is responsible for the smooth conduct of internal and external examinations. All matters involving the conduct of examinations, spot valuations, tabulations, preparation of Grade Sheet etc fall within the duties of the Examination Committee.

17. Is there any mechanism for Grievance Redressal?

Yes, the college has grievance redressal committee, headed by a senior faculty member of the college.

18. How many attempts are permitted for obtaining a Degree?

All such matters are defined in Rules & Regulations.

19. Who declares the result?

The result declaration process is also defined. After tabulation work, the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the College Academic Council for its approval. The result is then declared on the college notice boards and posted on the web site of the college. It is eventually sent to the University.

20. What is our relationship with the Jawaharlal Nehru Technological University Hyderabad?

We remain an affiliated college of the Jawaharlal Nehru Technological University Hyderabad. The University has the right to nominate its members on the academic bodies of the college.

21. Shall we require University approval if we want to start any New Courses?

Yes, It is expected that approvals or such other matters from an autonomous college will receive priority.

22. Shall we get autonomy for PG and Doctoral Programmes also?

Yes, presently our UG and PG programmes are also enjoying autonomous status.

23. How many exams will be there as an autonomous college?

This is defined in the Rules & Regulations.

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

Undertaking by Students/Parents

"To make the students **attend** the classes regularly from the first day of starting of classes and be aware of the **College regulations**, the following Undertaking Form is introduced which should be signed by both **student and parent**. The same should be submitted to the College Administrative Office."

I, Mr. / Ms. ---------- joining I Semester / III Semester for the academic year 2015-2016/ 2016-2017 in Vardhaman College of Engineering, Hyderabad, do hereby undertake and abide by the following terms, and I will bring the **ACKNOWLEDGEMENT** duly signed by me and my parent and submit it to the Admin Office.

1. I will **attend** all the classes from the **joining day** of the College as per the timetable. In case, I do not turn up even after two weeks of starting of classes, I shall be **ineligible** to continue for the current academic year.
2. I will be regular and punctual to all the classes (theory/practical/drawing) and secure overall attendance of **not less than 75%** as stipulated by College/JNTUH. I am fully aware that an overall attendance of less **than 65% will make me lose one year.**
3. I will compulsorily follow the **dress code** prescribed by the college.
4. I will conduct myself in a highly **disciplined** and decent manner both inside the classroom and on campus, failing which suitable action may be taken against me as per the rules and regulations of the College.
5. I will concentrate on my **studies** without wasting time in the Campus/Hostel/Residence and attend all the **tests** to secure more than the minimum prescribed Class/Sessional Marks in each subject. I will submit the **assignments** given in time to improve my performance.
6. I will not bring **Mobile Phone** to the College campus and also, I will not involve in any form of **ragging** inside or outside the campus. I am fully aware that bringing mobile phone to the campus is not permissible and involving in Ragging is an **offence** and punishable as per JNTUH/UGC rules and the law.
7. I will **pay** tuition fees, examination fees and any other **dues** within the stipulated time as required by the Institution/ authorities, failing which I will not be permitted to attend the classes.
8. I will **not cause or involve** in any sort of **violence or disturbance** both within and outside the college campus.
9. If I **absent myself continuously for 3 days**, my **parents** will have to meet the HOD concerned/ Principal.
10. I hereby **acknowledge** that I have **received** acopy of **R15 Academic Rules and Regulations, Syllabus copy** and hence, I shall **abide** by all the rules specified in it.

ACKNOWLEDGEMENT

I have carefully gone through the terms of the undertaking mentioned above and I understand that following these are for my/his/her own benefit and improvement. I also understand that if I/he/she fail to comply with these terms, shall be liable for suitable action as per College/JNTUH rules and the law. I undertake that I/he/she will strictly follow the above terms.

Signature of Student

Signature of Parent
Name & Address with Phone Number

-- STUDENT COPY --

VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)

Undertaking by Students/Parents

"To make the students **attend** the classes regularly from the first day of starting of classes and be aware of the **College regulations**, the following Undertaking Form is introduced which should be signed by both **student and parent**. The same should be submitted to the College Administrative Office."

I, Mr. / Ms. ---------- joining I Semester / III Semester for the academic year 2015-2016/ 2016-2017 in Vardhaman College of Engineering, Hyderabad, do hereby undertake and abide by the following terms, and I will bring the **ACKNOWLEDGEMENT** duly signed by me and my parent and submit it to the Admin Office.

1. I will **attend** all the classes from the **joining day** of the College as per the timetable. In case, I do not turn up even after two weeks of starting of classes, I shall be **ineligible** to continue for the current academic year.
2. I will be regular and punctual to all the classes (theory/practical/drawing) and secure overall attendance of **not less than 75%** as stipulated by College/JNTUH. I am fully aware that an overall attendance of less **than 65% will make me lose one year.**
3. I will compulsorily follow the **dress code** prescribed by the college.
4. I will conduct myself in a highly **disciplined** and decent manner both inside the classroom and on campus, failing which suitable action may be taken against me as per the rules and regulations of the College.
5. I will concentrate on my **studies** without wasting time in the Campus/Hostel/Residence and attend all the **tests** to secure more than the minimum prescribed Class/Sessional Marks in each subject. I will submit the **assignments** given in time to improve my performance.
6. I will not bring **Mobile Phone** to the College campus and also, I will not involve in any form of **ragging** inside or outside the campus. I am fully aware that bringing mobile phone to the campus is not permissible and involving in Ragging is an **offence** and punishable as per JNTUH/UGC rules and the law.
7. I will **pay** tuition fees, examination fees and any other **dues** within the stipulated time as required by the Institution/ authorities, failing which I will not be permitted to attend the classes.
8. I will **not cause or involve** in any sort of **violence or disturbance** both within and outside the college campus.
9. If I **absent myself continuously for 3 days**, my **parents** will have to meet the HOD concerned/ Principal.
10. I hereby **acknowledge** that I have **received** a copy of **R15 Academic Rules and Regulations, Syllabus copy** and hence, I shall **abide** by all the rules specified in it.

ACKNOWLEDGEMENT

I have carefully gone through the terms of the undertaking mentioned above and I understand that following these are for my/his/her own benefit and improvement. I also understand that if I/he/she fail to comply with these terms, shall be liable for suitable action as per College/JNTUH rules and the law. I undertake that I/he/she will strictly follow the above terms.

Signature of Student

Signature of Parent
Name & Address with Phone Number

-- OFFICE COPY --