

# **VARDHAMAN COLLEGE OF ENGINEERING**

**(AUTONOMOUS)**

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

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

[www.vardhaman.org](http://www.vardhaman.org)

## **MASTER OF TECHNOLOGY COMPUTER SCIENCE AND ENGINEERING**

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

### **CHOICE BASED CREDIT SYSTEM**

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

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





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## PRELIMINARY DEFINITIONS AND NOMENCLATURES

- ❖ “Autonomous Institution / College” means an institution / college designated as autonomous institute / college by University Grants Commission (UGC), as per the UGC Autonomous College Statutes.
- ❖ “Academic Autonomy” means freedom to a College in all aspects of conducting its academic programs, granted by the University for promoting excellence.
- ❖ “Commission” means University Grants Commission.
- ❖ “AICTE” means All India Council for Technical Education.
- ❖ “University” means Jawaharlal Nehru Technological University Hyderabad.
- ❖ “College” means Vardhaman College of Engineering, Hyderabad unless indicated otherwise by the context.
- ❖ “Program” means:
  - Master of Technology (M. Tech.) Degree program
  - PG Degree Program: M. Tech
- ❖ “Branch” means specialization in a program like M. Tech. program in Structural Engineering, M. Tech. program in Computer Science and Engineering etc.
- ❖ “Course” or “Subject” means a theory or practical subject, identified by its course – number and course-title, which is normally studied in a semester. For example, B4911 English for Research Papers Writing, means a theory or practical subject, identified by its course-number and course-title, which is normally studied in a semester. The description of allocation of course code is mentioned in the table 1.

**Table 1: Course Code Description**

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

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



## FOREWORD

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

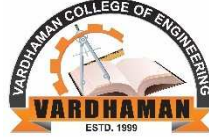
Vardhaman College of Engineering is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present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

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

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

**PRINCIPAL**





# **VARDHAMAN COLLEGE OF ENGINEERING**

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### **Institute Vision:**

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

### **Institute Mission:**

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

### **Quality Policy:**

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

### **Department Vision:**

- ❖ To be a leading source of competent computer engineers, meeting the needs of industry and society at large.

### **Department Mission:**

- ❖ Facilitate learning in advanced technologies adopting innovative methods
- ❖ Associate continuously with industry, with focus on curriculum design and implementation.
- ❖ Promote Research and Development through Special Interest Groups (SIGs)
- ❖ Provide platform for harnessing entrepreneurial and leadership qualities.







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## ACADEMIC REGULATIONS

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

## ACADEMIC REGULATIONS

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

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

### 1. APPLICABILITY

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

### 2. EXTENT

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

### 3. PROGRAMS OFFERED

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

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

### 4. ADMISSION

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

#### 4.1.1. Eligibility

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

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

#### 4.2. Admission Procedure:

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

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

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

## 5. MEDIUM OF INSTRUCTION

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

## 6. DURATION OF THE PROGRAMS

### 6.1 Normal Duration

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

### 6.2 Maximum Duration

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

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

## 7. SEMESTER STRUCTURE

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

**Table 2: Academic Calendar**

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

## 8. CHOICE BASED CREDIT SYSTEM

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

- 8.1 The duration of each semester will normally be 21 weeks with 6 days a week. A working day shall have 6 periods each of 60 minutes duration.
  - 1 credit per lecture period per week
  - 2 credits for four period hours of practical
  - 2 credits for mini project with seminar
  - 10 credits for project work phase – I
  - 16 credits for project work phase – II
- 8.2 The two year curriculum of any M.Tech Specialization of study shall have total of 68 credits. The exact requirements of credits for each course will be as recommended by the Board of Studies concerned and approved by the Academic Council.

## **9. COURSE REGISTRATION**

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

## **10. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS**

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

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

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

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

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

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

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

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

there are external marks of 100 and it is evaluated by the external examiner. The candidate has to secure a minimum of 50% marks in Project Evaluation (Viva-Voce) examination.

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

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

- 11.1.** A student shall be eligible to appear for semester-end examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- 11.2.** Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Council.
- 11.3.** Shortage of attendance below 65% in aggregate shall in no case be condoned.
- 11.4.** Students whose shortage of attendance is not condoned in any semester are not eligible to take their semester-end examination of that class and their registration shall stand cancelled.
- 11.5.** A student will not be promoted to the next semester unless he satisfies the attendance requirements of the current semester. The student may seek readmission for the semester when offered next. He will not be allowed to register for the subjects of the semester while he is in detention. A student detained due to shortage of attendance, will have to repeat that semester when offered next.

- 11.6.** A stipulated fee shall be payable towards condonation of shortage of attendance to the College.
- 11.7.** Attendance may also be condoned as per the recommendations of academic council for those who participate in prestigious sports, co-curricular and extra-curricular activities provided as per the Govt. of Telangana norms in vogue.

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

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

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

## **13. SUPPLEMENTARY EXAMINATION**

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

## **14. REVALUATION**

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

## **15. TRANSITORY REGULATIONS**

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

## **16. TRANSCRIPTS**

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

## **17. AWARD OF DEGREE**

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

### 17.1. Eligibility

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

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

### 17.2. Award of Class

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

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

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

### 17.3. Letter Grade and Grade Point

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

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

Grade	Grade Points (GP)	Percentage of Marks
O	10	≥ 90
A+	9	≥ 80 and <90
A	8	≥70 and < 80
B+	7	≥ 60 and <70
B	6	≥ 50 and <60
F	0	Below 50
AB	0	ABSENT

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

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

#### Semester Grade Point Average (SGPA)

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$\text{SGPA (S}_i\text{)} = \frac{\sum (\text{C}_i \times \text{G}_i)}{\sum \text{C}_i}$$

Where  $\text{C}_i$  is the number of credits of the  $i^{\text{th}}$  course and  $\text{G}_i$  is the grade point scored by student in the  $i^{\text{th}}$  course.

#### Cumulative Grade Point Average (CGPA)



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

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

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

## 18. REGISTRATION

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

## 19. TERMINATION FROM THE PROGRAM

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

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

## 20. CURRICULUM

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

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

## 21. WITH-HOLDING OF RESULTS

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

## 22. GRIEVANCES REDRESSAL COMMITTEE

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

Headed by Senior Faculty member

Heads of all departments

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

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

## 23. MALPRACTICE PREVENTION COMMITTEE

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

Principal

Subject expert of which the subject belongs to

Head of the department of which the student belongs to

The invigilator concerned

In-charge Examination branch of the college



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

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

#### **24. AMENDMENTS TO REGULATIONS**

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

#### **25. STUDENTS' FEEDBACK**

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

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

#### **26. GRADUATION DAY**

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

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

#### **27. AWARD OF A RANK UNDER AUTONOMOUS SCHEME**

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

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

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

#### **28. CONDUCT AND DISCIPLINE**

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

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

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

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

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

- 28.6.** Violation of code of conduct shall invite disciplinary action which may include punishment such as reprimand, disciplinary probation, debarring from the examination, withdrawal of placement services, withholding of grades / degrees, cancellation of registration, etc., and even expulsion from the college.
- 28.7.** Principal, based on the reports of the warden of Institute hostel, can reprimand, impose fine or take any other suitable measures against an inmate who violates either the code of conduct or rules and regulations pertaining to college hostel.
- 28.8.** A student may be denied the award of degree / certificate even though he / she have satisfactorily completed all the academic requirements if the student is found guilty of offences warranting such an action.
- 28.9.** Attendance is not given to the student during the suspension period.

## 29. OTHER ISSUES

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

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

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

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

## 30. GENERAL

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

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

## MALPRACTICES RULES

### DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the student:</i>	
<b>1. (a)</b>	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>(b)</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.
<b>2.</b>	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.
<b>3.</b>	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.
<b>4.</b>	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.
<b>5.</b>	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.
<b>6.</b>	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.
<b>7.</b>	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.
<b>8.</b>	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.
<b>9.</b>	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.
<b>10.</b>	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.
<b>11.</b>	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.
<b>12.</b>	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	



## **COURSE STRUCTURE (VCE-R18)**





## M. TECH - COMPUTER SCIENCE AND ENGINEERING

REGULATIONS: VCE-R18

I YEAR I SEMESTER							
Code	Subject	Periods per Week		Credits	Scheme of Examination Maximum Marks		
		L	P		Internal	External	Total
B4201	Advanced Operating Systems	3	0	3	30	70	100
B4202	Advanced Data Structures	3	0	3	30	70	100
<b>PROGRAM ELECTIVE – I</b>		3	0	3	30	70	100
<b>PROGRAM ELECTIVE – II</b>		3	0	3	30	70	100
B4905	Research Methodology and Intellectual Property Rights	2	0	2	30	70	100
B4203	Advanced Operating Systems Laboratory	0	4	2	30	70	100
B4204	Advanced Data Structures Laboratory	0	4	2	30	70	100
	Audit Course – I	2	0	0	100*	0	100*
<b>TOTAL</b>		<b>16</b>	<b>08</b>	<b>18</b>	<b>210</b>	<b>490</b>	<b>700</b>
I YEAR II SEMESTER							
Code	Subject	Periods per week		Credits	Scheme of Examination Maximum Marks		
		L	P		Internal	External	Total
B4205	Advanced Algorithms	3	0	3	30	70	100
B4206	Cloud Computing	3	0	3	30	70	100
<b>PROGRAM ELECTIVE – III</b>		3	0	3	30	70	100
<b>PROGRAM ELECTIVE – IV</b>		3	0	3	30	70	100
B4207	Advanced Algorithms Laboratory	0	4	2	30	70	100
B4208	Cloud Computing Laboratory	0	4	2	30	70	100
B4209	Mini Project with Seminar	0	4	2	100	0	100
	Audit Course – II	2	0	0	100*	0	100*
<b>TOTAL</b>		<b>14</b>	<b>12</b>	<b>18</b>	<b>280</b>	<b>420</b>	<b>700</b>
II YEAR I SEMESTER							
Code	Subject	Periods per week		Credits	Scheme of Examination Maximum Marks		
		L	P		Internal	External	Total
<b>PROGRAM ELECTIVE –V</b>		3	0	3	30	70	100
<b>OPEN ELECTIVE</b>		3	0	3	30	70	100
B4210	Major Project Phase-I	0	20	10	100	0	100
<b>TOTAL</b>		<b>6</b>	<b>20</b>	<b>16</b>	<b>160</b>	<b>140</b>	<b>300</b>
II YEAR II SEMESTER							
Code	Subject	Periods per week		Credits	Scheme of Examination Maximum Marks		
		L	P		Internal	External	Total
B4211	Major Project Phase-II	0	32	16	30	70	100
<b>TOTAL</b>		<b>0</b>	<b>32</b>	<b>16</b>	<b>30</b>	<b>70</b>	<b>100</b>

\* Grade Points awarded for audit courses will not be considered for calculating SGPA and CGPA.

**M. TECH - COMPUTER SCIENCE AND ENGINEERING**

REGULATIONS: VCE-R18

PROGRAM ELECTIVES			
PROGRAM ELECTIVE – I		PROGRAM ELECTIVE – II	
Code	Subject	Code	Subject
<b>B4251</b>	Digital Image Processing	<b>B4254</b>	Data warehousing and Data Mining
<b>B4252</b>	Number Theory and Cryptography	<b>B4255</b>	Artificial Intelligence and Neural Networks
<b>B4253</b>	Distributed Computing	<b>B4256</b>	Object Oriented Analysis and Design
PROGRAM ELECTIVE – III		PROGRAM ELECTIVE – IV	
Code	Subject	Code	Subject
<b>B4257</b>	Computer Vision and Pattern Recognition	<b>B4260</b>	Information Retrieval Systems
<b>B4258</b>	Web Security	<b>B4261</b>	Machine Learning
<b>B4259</b>	Mobile Computing	<b>B4262</b>	Design Patterns
PROGRAM ELECTIVE – V			
Code	Subject		
<b>B4263</b>	Human Computer Interaction		
<b>B4264</b>	Computer Graphics		
OPEN ELECTIVES		AUDIT COURSE-I & II	
<b>B4901</b>	Business Analytics	<b>B4911</b>	English for Research Papers Writing
<b>B4902</b>	Industrial safety	<b>B4912</b>	Disaster Management
<b>B4903</b>	Operations Research	<b>B4913</b>	Sanskrit for Technical Knowledge
<b>B4904</b>	Waste to Energy	<b>B4914</b>	Value Education
		<b>B4915</b>	Constitution of India
		<b>B4916</b>	Pedagogy Studies
		<b>B4917</b>	Stress Management by Yoga
		<b>B4918</b>	Personality Development through Life Enlightenment skills



**SYLLABI FOR  
I YEAR I SEMESTER**

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year I Sem.

VCE-R18

**ADVANCED OPERATING SYSTEMS**

Course Code: B4201

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**INTRODUCTION:** Operating system concept, Operating-System Structure, Operating-System Operations. Process Management: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication, Examples of IPC Systems, and Communication in Client Server Systems. Multithreaded Programming: Multithreading Models, Thread Libraries, Threading Issues, Operating-System Examples.

**UNIT - II**

**PROCESS COORDINATION:** Process Scheduling, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling. Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Atomic Transactions, message passing.

**DEADLOCKS:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

**UNIT III**

**MEMORY MANAGEMENT:** Memory management and virtual memory, logical versus physical address space, swapping, contiguous allocation, paging, segmentation, segmentation with paging. Demand paging, performance of demanding paging, page replacement, page replacement algorithm, allocation of frames, thrashing.

**UNIT - IV**

**INTRODUCTION TO DISTRIBUTED SYSTEMS:** Goals of distributed system, hardware and software concepts, design issues. Communication in distributed systems- the client / server model, remote procedure call and group communication.

**UNIT - V**

**SYNCHRONIZATION IN DISTRIBUTED SYSTEMS:** Clock synchronization, mutual exclusion, Election algorithms, the bully algorithm, a ring algorithm, and atomic transactions.

**DISTRIBUTED DEADLOCKS:** Deadlock in distributed systems, distributed deadlock prevention, and distributed dead lock detection.

**TEXT BOOKS:**

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne (2008), *Operating System Principles*, 8th edition, John Wiley & Sons, Inc.
2. Andrew S. Tanenbaum (2001), *Distributed Operating Systems*, 2<sup>nd</sup> edition, Pearson Education, India.

**REFERENCE BOOKS:**

1. Mukesh Singhal, Niranjana (2001), *Advanced Concepts in Operating Systems*, Tata Mcgraw Hill, New Delhi.
2. Andrew S. Tanenbaum (2006), *Modern Operating Systems*, 2<sup>nd</sup> edition, Pearson Education, India.
3. Pradeep K. Sinha (2002), *Distributed Operating Systems and concepts*, Prentice Hall of India.
4. William Stallings (2005), *Operating Systems: Internals and Design Principles*, 5th edition, Pearson Education

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year I Sem.

VCE-R18

**ADVANCE DATA STRUCTURES**

Course Code: B4202

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**OVERVIEW OF DATA STRUCTURES:** singly linked lists, doubly linked lists, circular list, representing stacks and queues using arrays and linked lists, infix to post fix conversion, postfix expression evaluation. Priority Queues – Realizing a Priority Queue using Heaps, Definition, insertion, Deletion.

**UNIT - II**

**DICTIONARIESHASH TABLES:** Dictionaries, linear list representation, operations insertion, deletion and searching, hash table representation, hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

**UNIT - III**

**TREES AND GRAPHS:** Introduction, definition and basic terminologies of trees and binary trees, representation of trees and binary trees, binary tree traversals, binary search trees: definition, operations and applications. threaded binary trees; Graphs basic concepts, representation and traversals.

**UNIT - IV**

**SEARCH TREES:** AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red Black and Splay Trees, B- trees: definition, operations and applications. R-trees: Nearest neighbour Query, join and range queries

**UNIT - V**

**ALGORITHM ANALYSIS:** Efficiency of algorithms, apriori analysis, asymptotic notations, time complexity of an algorithm using o notation, polynomial vs. exponential algorithms, average, best and worst case complexities, analyzing recursive programs.

**TEXT BOOKS:**

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran (2008), *Fundamentals of Computer Algorithms*, 2<sup>nd</sup> edition, University Press (India) Private Limited, India.
2. G. A. V. Pai (2009), *Data Structures and Algorithms*, Tata Mcgraw hill, New Delhi.

**REFERENCE BOOKS:**

1. D. Samanta (2003), *Classic Data Structures*, Prentice Hall of India Private Limited.
2. Aho, Hopcraft, Ullman (1998), *Design and Analysis of Computer Algorithms*, Pearson Education India.
3. Goodman, Hedetniemi (2002), *Introduction to the Design and Analysis of Algorithms*, Tata Mcgraw Hill, New Delhi, India.
4. Adam Drozdek (2005), *Data Structures and Algorithms in C++*, 3rd Edition, Thomson Course Technology.

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year I Sem.

VCE-R18

**RESEARCH METHODOLOGY AND INTELLECTUAL PROPERTY RIGHTS**

Course Code: B4005

L	P	C
2	0	2

**SYLLABUS**

**UNIT-I**

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.

Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

**UNIT-II**

Effective literature studies approaches, analysis Plagiarism, Research ethics.

**UNIT-III**

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

**UNIT-IV**

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development.

International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

**UNIT-V**

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System.

New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year I Sem.

VCE-R18

**DIGITAL IMAGE PROCESSING**

(Program Elective – I)

Course Code: B4251

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**DIGITAL IMAGE FUNDAMENTALS:** Image acquisition, image model, sampling, quantization, relationship between pixels, distance measures, connectivity, imaging geometry.

**IMAGE TRANSFORMS:** Two dimensional DFT, FFT- properties, Walsh transform, hadamard transform, discrete cosine transform, haar transform

**UNIT - II**

**IMAGE ENHANCEMENT:** Point processing, histogram processing, spatial filtering, enhancement in frequency domain, image smoothing, image sharpening.

**IMAGE RESTORATION:** Degradation model, algebraic approach to restoration, inverse filtering, least mean square filters, constrained least squares restoration, interactive restoration.

**UNIT - III**

**IMAGE SEGMENTATION:** Detection of discontinuities, edge linking and boundary detection, thresholding, region oriented segmentation, the use of motion in segmentation.

**IMAGE COMPRESSION:** Redundancies and their removal methods, fidelity criteria, image compression models, source encoder and decoder, error free compression, lossy compression.

**UNIT – IV**

**COLOR IMAGE PROCESSING:** Fundamentals, models, pseudocolor image, color transformation, smoothing, color segmentation, noise in color image.

**UNIT - V**

**MORPHOLOGY:** Dilation, erosion, opening, closing, hit-and-miss transform, boundary extraction, region filling, connected components, thinning, thickening, skeletons,

**TEXT BOOKS:**

1. R. C. Gonzalez, R. E. Woods (2002), *Digital Image processing*, 2nd edition, Addison Wesley, India.
2. Rafael C. Gonzalez and Richard E. Woods (2008), *Digital Image Processing*, Low Price Edition, Pearson Education, India.

**REFERENCE BOOKS:**

1. Anil K. Jain, Jain (1997), *Fundamentals of Digital Image processing*, Prentice Hall of India Private Limited.
2. Arthur R. Weeks, Jr. (PHI) (1996), *Fundamentals of Electronic Image Processing*, SPIE
3. Rafael C. Gonzalez, Richard E. Woods and Steven. L (2004), *Digital Image processing using MAT LAB*, Pearson Education Asia.



**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year I Sem.

VCE-R18

**NUMBER THEORY AND CRYPTOGRAPHY**  
(Program Elective – I)

Course Code: B4252

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**NUMBER THEORY:** Prime and Relatively prime numbers, testing for primality.

**MODULAR ARITHMETIC:** Fermat's and Euler's theorems, Euclid's Algorithm, Extended Euclid's Algorithm, the Chinese remainder theorem, Discrete Logarithmic Problem. Random Number Generation Algorithms.

**UNIT - II**

**CONVENTIONAL ENCRYPTION:** Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

**ALGORITHMS:** Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block ciphers. Placement of Encryption function, Key distribution.

**UNIT - III**

**PUBLIC KEY CRYPTOGRAPHY:** Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

**MESSAGE AUTHENTICATION AND HASH FUNCTIONS:** Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

**UNIT - IV**

**HASH AND MAC ALGORITHMS:** MD5, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC.

**DIGITAL SIGNATURES AND AUTHENTICATION PROTOCOLS:** Digital signatures, Authentication Protocols, Digital signature standards.

**UNIT - V**

**AUTHENTICATION APPLICATIONS:** Kerberos, X.509 directory Authentication service.

**TEXT BOOKS:**

1. William Stallings, *Cryptography and Network Security: Principles and Practice*, Pearson Education, 2000.

**REFERENCE BOOKS:**

1. Perlman & Speciner, *Network Security – Private Communication in a public world*, 2nd ed., Kaufman, , PHI, 2003.

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year I Sem.

VCE-R18

**DISTRIBUTED COMPUTING**

(Program Elective – I)

Course Code: B4253

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**INTRODUCTION:** The different forms of computing, monolithic, distributed, parallel and cooperative computing, the meaning of distributed computing, examples of distributed systems, the strengths and weaknesses of distributed computing, operating system concepts relevant to distributed computing, the architecture of distributed applications.

**DISTRIBUTED COMPUTING PARADIGMS:** Paradigms for distributed applications, message passing paradigm, the client-server paradigm (java socket API), the peer-to-peer paradigm

**MESSAGE SYSTEM (MOM) PARADIGM:** The point-to-point message model and the publish/subscribe message model, RPC model.

**UNIT - II**

**THE DISTRIBUTED OBJECTS PARADIGMS:** RMI, ORB, the object space paradigm, the mobile agent paradigm, the network services paradigm, the collaborative application (groupware paradigm), choosing a paradigm for an application.

**UNIT - III**

**DISTRIBUTED OBJECTS PARADIGM (RMI):** Message passing versus distributed objects, archetypal distributed object architecture, distributed object systems, RPC, RMI, the java RMI architecture, java RMI API, a sample RMI application, steps for building an RMI application, testing and debugging, comparison of RMI and socket API.

**UNIT - IV**

**DISTRIBUTED OBJECT PARADIGM(CORBA):**The basic architecture, the CORBA object interface, inter-ORB protocols, object servers and object clients, CORBA object references, CORBA naming service and the interoperable naming service, CORBA object services, object adapters, java IDL, an example CORBA application.

**UNIT - V**

**DISTRIBUTED DOCUMENT BASED SYSTEMS:** WWW, lotus notes, comparison of WWW and lotus notes.

**DISTRIBUTED COORDINATION BASED SYSTEMS:** Introduction to coordination models, TIB, JINI, comparison of TIB and JINI, software agents, agent technology, mobile agents.

**DISTRIBUTED MULTIMEDIA SYSTEMS:** Characteristics of multimedia data, QOS of service management, resource management, stream adaptation.

**TEXT BOOKS:**

1. M. L. Liu (2004), *Distributed Computing Principles and Applications*, 1st Edition, Pearson Education, India.
2. R. Orfali, Dan Harkey, Jeri Edwards (1999), *Client/Server Programming with Java and CORBA*, 3rd Edition, John Wiley, New York, USA.

**REFERENCE BOOKS:**

1. J. Joseph, C. Fellenstein (2009), *Grid Computing*, 5th Edition, Pearson education, India.
2. Rajkumar Buyya (2008), *High Performance Cluster Computing*, 2nd Edition, Pearson education.
3. D. Minoli (2005), *A Networking Approach to Grid Computing*, 1st Edition, Wiley & sons, USA.
4. A. Abbas (2004), *Grid Computing: A Practical Guide to Technology and Applications*, 1st Edition, Firewall Media, India.
5. G. Coulouris, J. Dollimore and Tim Kindbirg (2005), *Distributed Systems Concepts and Design*, 4th Edition, Wiley & sons, New Jersey, USA.

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year I Sem.

VCE-R18

**DATA WAREHOUSING AND DATA MINING**  
(Program Elective – II)

Course Code: B4254

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**INTRODUCTION:** Data mining, kinds of data, data mining functionalities, classification of data mining systems, data mining primitives, major issues in data mining.

**DATA PREPROCESSING:** Descriptive data summarization, data cleaning, data integration and transformation, data reduction, data discretization and concept hierarchy generation.

**UNIT - II**

**DATA WAREHOUSE AND OLAP TECHNOLOGY:** What is data warehouse, a multidimensional data model, data warehouse architecture, data warehouse implementation, from data warehouse to data mining.

**UNIT - III**

**MINING FREQUENT PATTERNS AND ASSOCIATIONS:** Basic concepts, efficient and scalable frequent item set mining methods, mining various kinds of association rules.

**CLASSIFICATION AND PREDICTION:** Issues regarding classification and prediction, classification by decision tree induction, bayesian classification, rule based classification, prediction, accuracy and error measures.

**UNIT - IV**

**CLUSTER ANALYSIS:** Types of data in cluster analysis, a categorization of major clustering methods, partitioning methods, hierarchical methods, density based methods, grid based methods, model based clustering methods, clustering high dimensional data, outlier analysis.

**UNIT - V**

**MINING STREAM, TIME SERIES AND SEQUENCE DATA:** Mining data streams, mining time series data, mining sequence patterns in biological data.

**MINING OBJECT, SPATIAL, MULTIMEDIA, TEXT AND WEB DATA:** Multidimensional analysis and descriptive mining of complex data objects, spatial data mining, multimedia data mining, text mining, mining the world wide web.

**TEXT BOOKS:**

1. Jiawei Han, Micheline Kamber, Jian Pei (2011), *Data Mining Concepts and Techniques*, 3rd edition, Elsevier, India.

**REFERENCE BOOKS:**

1. Margaret H Dunham (2006), *Data Mining Introductory and Advanced Topics*, 2nd edition, Pearson Education, India.
2. Amitesh Sinha (2007), *Data Warehousing*, Thomson Learning.
3. Arun K Pujari (2004), *Data Mining Techniques*, University Press (India) Private Limited, India.
4. W. H. Inmon (2005), *Building the Data Warehouse*, Wiley Dreamtech India Pvt. Ltd, India.

**VARDHAMAN COLLEGE OF ENGINEERING**  
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M. Tech. CSE I Year I Sem.

VCE-R18

**ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS**

(Program Elective – II)

Course Code: B4255

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**INTRODUCTION TO ARTIFICIAL INTELLIGENCE:** Problem and search, what is AI technique, criteria for success; problems, problem space and search, defining the problem as a state space search, production systems, problem characteristics, production system characteristics.

**HEURISTIC SEARCH TECHNIQUES:** Knowledge representation, knowledge representation issues, using predicate logic, resolution principle. Representing knowledge using rules, forward vs backward reasoning, symbolic reasoning under uncertainty, non-monotonic reasoning, statistical reasoning.

**UNIT - II**

**DIFFERENT KNOWLEDGE REPRESENTATION SCHEMES:** Semantic nets, Marvin minsky's frames, conceptual dependency theory, scripts. Understanding, what is understanding, what makes understanding hard, understanding as constraint satisfaction, waltz's algorithm.

**UNIT - III**

**NATURAL LANGUAGE PROCESSING:** Overview of linguistics, grammars and languages, basic parsing techniques, transitional networks, semantic analysis and representation structures. Natural language generation, natural language systems, general concepts in knowledge acquisition. Types of learning, general learning model, performance measures, early work in machine learning, perceptrons, genetic algorithms, intelligent editors.

**EXPERT SYSTEM ARCHITECTURE:** Characteristic features of expert systems, history, applications. Rule based system architecture, expert system shells. Pattern recognition, the recognition and classification process, learning classification patterns, recognizing and understanding speech. Perception and action, features of AI programming language PROLOG.

**UNIT - IV**

**INTRODUCTION TO NEURAL NETWORKS:** What is a neural network? human brain, models of neuron, neural networks viewed as directed graphs, feedback, network architectures, knowledge representation, artificial intelligence and neural networks.

**LEARNING PROCESSES:** Introduction, error-correction learning, learning with a teacher, learning without a teacher, learning tasks, statistical nature of the learning process, statistical learning theory, probably approximately correct model of learning.

**UNIT - V**

**SINGLE LAYER PERCEPTRONS**

Introduction, adaptive filtering problem, unconstrained optimization techniques, linear least-squares filters, least mean square algorithm, learning curves, learning rate annealing techniques, perceptron, perceptron convergence theorem, relation between the perceptron and bayes classifier for a gaussian environment.

**MULTILAYER PERCEPTRONS:** Introduction, some preliminaries, back-propagation algorithm, summary of back-propagation algorithm, XOR problem.

**TEXT BOOKS:**

1. Elaine Rich, Kevin Knight (2002), *Artificial Intelligence*, 2nd edition, Tata McGraw Hill, New Delhi.
2. Simon Haykin (1999), *Neural Networks: a Comprehensive Foundation*, 2nd edition, Pearson Education, India.

**REFERENCE BOOKS:**

1. Patrick Henry Winston (2001), *Artificial Intelligence*, 3rd edition, Pearson Education Private Limited, India.
2. Dan W. Patterson (1999), *Introduction to Artificial Intelligence and Expert Systems*, Prentice Hall of India.
3. Satish Kumar (2004), *Neural Networks: A classroom approach*, Tata McGraw Hill, New Delhi.
4. N. J Nilsson (2005), *Principles of Artificial Intelligence*, Morgan Kaufmann.
5. B. Yegnanarayana (2001), *Artificial Neural Networks*, Prentice Hall of India.

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year I Sem.

VCE-R18

**OBJECT ORIENTED ANALYSIS AND DESIGN**  
(Program Elective – II)

Course Code: B4256

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**INTRODUCTION:** Object-Oriented Analysis and Design, Iterative Development and the Unified Process, Case Study: The NextGen POS System.

**INCEPTION:** Inception, Understanding Requirements, Use-Case Model: Writing Requirements in Context, Identifying Other Requirements, From Inception to Elaboration.

**UNIT - II**

**ELABORATION ITERATION 1 (ANALYSIS):** Use-Case Model: Drawing System Sequence Diagrams, Domain Model: Visualizing Concepts, Domain Model: Adding Associations, Domain Model: Adding Attributes, Use-Case Model: Adding Detail with Operation Contracts, From Requirements to Design in this Iteration, Interaction Diagram Notation.

**UNIT- III**

**ELABORATION ITERATION 1 (DESIGN):** GRASP: Designing Objects with Responsibilities, Design Model: Use-Case Realizations with GRASP Patterns, Design Model: Determining Visibility, Design Model: Creating Design Class Diagrams, Implementation Model: Mapping Designs to Code.

**ELABORATION ITERATION 2:** Iteration 2 and its Requirements, GRASP: More Patterns for Assigning Responsibilities, Designing Use-Case Realizations with GoF Design Patterns.

**UNIT- IV**

**ELABORATION ITERATION 3:** Iteration 3 and Its Requirements, Relating Use Cases, Modelling Generalization, Refining the Domain Model, Adding New SSDs and Contracts, Modelling Behaviour in State Chart Diagrams.

**UNIT- V**

**DESIGNING THE LOGICAL ARCHITECTURE WITH PATTERNS:** Organizing the Design and Implementation Model Packages, Introduction to Architectural Analysis and the SAD.

**TEXT BOOKS:**

1. Larman, Craig, *Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development*, Pearson Education, 3<sup>rd</sup> Ed., 2004.

**REFERENCE BOOKS:**

1. Mark Priestley, *Practical Object Oriented Design with UML*, TMH, 2<sup>nd</sup> Ed., 2005.
2. Grady Booch, *Unified Modeling Language User Guide*, Pearson Education, 1999
3. Martin Fowler et al., *UML Distilled*, Pearson Education, 2000

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year I Sem.

VCE-R18

**ADVANCED OPERATING SYSTEMS LABORATORY**

Course Code: B4203

L	P	C
0	4	2

**LIST OF EXPERIMENTS**

1. Implement CPU scheduling algorithms - FCFS, SJF, Priority, RR and Multi level.
2. Implement contiguous Memory management techniques - Best Fit, Worst Fit and First Fit.
3. Demonstrate Inter-process communication using – Pipes, Message Queues and Shared Memory.
4. Implementation of Process Synchronization for Readers-Writers and Dining Philosophers problem.
5. Demonstrate Deadlock handling:
  - i) Resource Allocation Graph
  - ii) Safety Algorithm
  - iii) Resource Request algorithm
  - iv) Wait for graph.
6. Implement a chat server using JAVA API.
7. Implement a mini DNS protocol using RMI.
8. Develop FTP Server and Provide GUI interfaces for accessing all of the services.
9. Implement a 2PC for distributed transaction management.
10. Design a Web service using Simple Object Access Protocol (SOAP).

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year I Sem.

VCE-R18

**ADVANCED DATA STRUCTURES LABORATORY**

Course Code: B4204

L	P	C
0	4	2

**LIST OF EXPERIMENTS**

1. a) Write a C program that implement stack (its operations) using arrays  
b) Write a C program that uses Stack operations to convert infix expression into postfix expression
2. a) Write C programs that implement Queue (its operations) using arrays  
b) Write C programs that implement Queue (its operations) using linked lists
3. a) Write a C program that uses functions to create a singly linked list  
b) Write a C program that uses functions to perform insertion operation on a singly linked list  
c) Write a C program that uses functions to perform deletion operation on a singly linked list
4. Write a C program to perform the following operations:  
a) Insert an element into a binary search tree  
b) Delete an element from a binary search tree  
c) Search for a key element in a binary search tree
5. Write a C program to perform the following operations on B -Trees and AVL-trees:  
a) Insertion                      b) Deletion
6. Write C programs for the implementation of BFS and DFS for a given graph.
7. Write C programs to implement the following to generate a minimum cost spanning tree:  
a) Prim's algorithm   b) Kruskal's algorithm.
8. Write a C program to solve the single source shortest path problem. (Note: Use Dijkstra's algorithm).
9. Write C program that uses non-recursive functions to traverse a binary tree in:  
a) Pre-order                      b) In-order                      c) Post-order
10. Write a C program to find optimal ordering of matrix multiplication. (Note: Use Dynamic programming method).
11. Consider the problem of eight queens on an (8x8) chessboard. Two queens are said to attack each other if they are on the same row, column, or diagonal. Write a C program that implements backtracking algorithm to solve the problem. i.e. place eight non - attacking queens on the board.
12. Write a C program to implement dynamic programming algorithm to solve the all pairs shortest path problem.
13. Write a C program to solve 0/1 knapsack problem using the following:  
a) Greedy algorithm                      b) Dynamic programming algorithm  
c) Backtracking algorithm                      d) Branch and bound algorithm.
14. Write a C program that uses dynamic programming algorithm to solve the optimal binary search tree problem.
15. Write a C program for solving traveling sales person's problem using the following:  
a) Dynamic programming algorithm   b) The back tracking algorithm   c) Branch and Bound

**SYLLABI FOR  
I YEAR II SEMESTER**



**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year II Sem.

VCE-R18

**ADVANCED ALGORITHMS**

Course Code: B4205

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

INTRODUCTION - Algorithm definition, Pseudo code Specifications, Performance Analysis-Space Complexity, Time Complexity, Asymptotic Notations-Big-Oh, Omega, and Theta. Recurrences: types of recurrence relations, substitution Method, Master's Method.

DIVIDE AND CONQUER - General Method, Binary Search, Finding Maximum and Minimum, Merge Sort, Quick sort, Strassen's Matrix Multiplication. Multiplication of large integers.

**UNIT - II**

THE GREEDY METHOD - General Method, Real Knapsack Problem, Job sequencing with deadlines, Minimum-cost spanning trees- Prim's Algorithm and Kruskal's algorithm, Optimal storage on tapes, Optimal merge pattern, Single source shortest Path, huffman codes.

**UNIT III**

DYNAMIC PROGRAMMING - General method, All pairs shortest path, Matrix Chain Multiplication, Optimal Binary search trees, 0/1 Knapsack, the travelling salesman problem, Reliability design, Flow shop scheduling.

**UNIT - IV**

GRAPHS - Breadth first search, depth first search, Topological Sort, connected and bi connected components, articulation points.

BACK TRACKING - The General Method, The n-Queens Problem, Sum of subsets, Graph coloring, Hamiltonian cycles, Knapsack Problem.

**UNIT - V**

BRANCH AND BOUND - General method, applications - Travelling sales person problem, 0/1 knapsack problem LC Branch and Bound solution, FIFO Branch and Bound solution.

NP-hard and NP-complete problems - Basic concepts, Non-deterministic algorithms, NP-Hard and NP Complete Classes, Clique Decision Problem, Cook's Theorem.

**TEXT BOOKS:**

1. Ellis Horowitz, Satraj Sahni, Rajasekharam, Fundamentals of Computer Algorithms, 2nd edition, University Press, New Delhi.

**REFERENCE BOOKS:**

1. R. C. T. Lee, S. S. Tseng, R.C. Chang and T. Tsai, Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill, India.

2. Allen Weiss, Data structures and Algorithm Analysis in C++, 2nd edition, Pearson education, New Delhi.

3. Aho, Ullman, Hopcroft, Design and Analysis of algorithms, 2nd edition, Pearson education, New Delhi.

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year II Sem.

VCE-R18

**CLOUD COMPUTING**

Course Code: B4206

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**CLOUD COMPUTING BASICS:** Cloud computing overview, applications, intranets and the cloud, first movers in the cloud.

**UNIT - II**

**YOUR ORGANIZATION AND CLOUD COMPUTING:** When you can use cloud computing, benefits, limitations, security concerns, regulatory issues.

**CLOUD COMPUTING WITH THE TITANS:** Google, EMC, netapp, Microsoft, Amazon, salesforce.com IBM, partnerships.

**UNIT - III**

**THE BUSINESS CASE FOR GOING TO THE CLOUD:** Cloud computing services, how those applications help your business, deleting your datacenter, salesforce.com and Thomson REUTERS.

**UNIT - IV**

**HARDWARE AND INFRASTRUCTURE:** Clients, security, network, services.

**ACCESSING THE CLOUD:** Platforms, web applications, web APIs, web browsers.

**CLOUD STORAGE VENDORS:** Overview of cloud storage, cloud storage providers.

**STANDARDS:** Application, client, infrastructure, service.

**UNIT - V**

**DEVELOPING CLOUD SERVICES:** Types of cloud service development, software as a service: overview, driving forces, company offerings, industries, software plus services: overview, mobile device integration, providers, microsoft online, platform as a service, web services, on-demand computing, discovering cloud services, development services and tools.

**DEVELOPING APPLICATIONS:** Google, Microsoft, intuit quick base, cast iron cloud, bungee connect development, troubleshooting, application management.

**LOCAL CLOUDS AND THIN CLIENTS:** Virtualization in your organization, server solutions, thin client's case study: Mcneilus steel.

**TEXT BOOKS:**

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter(2010), *Cloud Computing: A Practical Approach*, Mc Graw hill, New Delhi, India.
2. Michael Miller (2008), *Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online*, Que Publishing.

**REFERENCE BOOKS:**

1. Haley Beard (2008), *Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs*, 2<sup>nd</sup> edition, Emereo Pty Limited, USA.
2. Tim Mather, Subra Kumaraswamy, Shahed Latif (2009), *Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice)*, 3<sup>rd</sup> edition, O'Reilly Media, Inc, India.

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year II Sem.

VCE-R18

**COMPUTER VISION AND PATTERN RECOGNITION**

(Program Elective – III)

Course Code: B4257

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**CAMERAS:** Pinhole cameras, camera with lenses, the human eye sensing. Radiometry, measuring light: light in space, light at surfaces, important special cases.

**UNIT - II**

**SOURCES - SHADOWS AND SHADING:** Qualitative radiometry- sources and their effects- local shading models- application: photometric stereo- inter reflections: global shading models.

**LINEAR FILTERS:** Linear filters and convolution, shift invariant linear systems, spatial frequency and Fourier transforms, sampling and aliasing, filters as templates technique: normalized correlation and finding patterns technique: scale and image pyramids.

**UNIT - III**

**EDGE DETECTION:** Noise estimating derivatives, detecting edges.

**TEXTURE:** Representing texture, analysis using oriented pyramids and application: synthesizing textures for rendering shape for texture for planes.

**UNIT - IV**

**BASICS OF PATTERN RECOGNITION:** Introduction, features, feature vectors, and classifiers supervised, unsupervised, and semi-supervised learning, Bayesian decision theory, classifiers, discriminant functions, decision surfaces, normal density and discriminant functions, discrete features.

**UNIT - V**

**PARAMETER ESTIMATION METHODS:** Maximum-likelihood estimation, gaussian mixture models, expectation-maximization method, bayesian estimation, the nearest neighbor rule

**LINEAR CLASSIFIERS:** the perceptron algorithm, linear discriminant functions and decision hyperplanes, support vector machines

**TEXT BOOKS:**

1. David A. Forsyth, Jean Ponce (2003), *Computer Vision: A Modern Approach*, Prentice Hall of India.
2. S. Theodoridis, K. Koutroumbas (2009), *Pattern Recognition*, 4th edition, Academic Press.

**REFERENCE BOOKS:**

1. Sommer (2001), *Geometric Computing with Clifford Algebras: Theoretical Foundations and applications in Computer Vision and Robotics*, 1st edition, Springer.
2. Sonka (2008), *Digital Image Processing and Computer Vision*, 1st edition, Thomson Learning.
3. Jack (2000), *Computer Vision and Applications: Concise Edition (With CD)*, Academy Press.
4. R. O. Duda, P. E. Hart and D. G. Stork (2001), *Pattern Classification*, John Wiley, India.

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year II Sem.

VCE-R18

**WEB SECURITY**  
(Program Elective – III)

Course Code: B4258

L	P	C
3	0	3

**SYLLABUS**

**UNIT-I:**

**INTRODUCTION:** Overview of ISO's OSI model and TCP/IP model, Key Management, X.509 certificates, Public- Key Infrastructure (PKI), Remote user authentication using symmetric key encryption, Kerberos, Remote user authentication using asymmetric key encryption Federated Identity management, Biometrics

**WIRELESS NETWORK SECURITY:** IEEE 802.11 Wireless LAN Overview: The Wi-Fi Alliance, IEEE 802 Protocol Architecture, IEEE 802.11 Network Components and Architectural Model, IEEE 802.11 Services, IEEE 802.11i

**UNIT - II**

**WIRELESS LAN SECURITY:** IEEE 802.11i Services, IEEE 802.11i Phases of Operation, Discovery Phase, Authentication Phase, Key Management Phase, Protected Data Transfer Phase, The IEEE 802.11i Pseudorandom Function.

**UNIT - III**

**WAP SECURITY: Wireless** Application Protocol Overview: Operational Overview, WAP Architecture, Wireless Application environment, WAP Protocol Architecture, Wireless Transport Layer Security: WTLS Sessions and Connections, WTLS Protocol Architecture, Cryptographic Algorithms, WAP End-to-End Security.

**UNIT - IV:**

**ELECTRONIC MAIL SECURITY:** Pretty Good Privacy: Notation, Operational Description, Cryptographic Keys and Key Rings, Public-Key Management, S/MIME: RFC 5322, Multipurpose Internet Mail Extensions, S/MIME Functionality, S/MIME Messages, S/MIME Certificate Processing, Enhanced Security Services, Domain Keys Identified Mail : Internet Mail Architecture, E-mail Threats, DKIM Strategy, DKIM Functional Flow.

**WEB AND IP SECURITY WEB SECURITY:** Web security requirements, Secure Sockets Layer (SSL), Transport Layer Security (TLS), and Secure Electronic Transaction (SET), HTTP, Secure Shell (SSH).

**UNIT - V**

**IP SECURITY:** IP Security overview, Architecture, Authentication, Encapsulating security payload, Combining security associations, Key management.

**SYSTEM SECURITY INTRUDERS,** Intrusion detection, Password management, malicious software, Viruses and related threats, Virus countermeasures, Distributed denial of service attacks, Firewalls: Firewall design principles, trusted systems.

**TEXT BOOKS:**

1. William Stallings *Cryptography and Network Security: Principles and Practice*, 5<sup>th</sup> Edition, Pearson Education. (ISBN:978-81-317-6166-3)
2. Behrouz A. Forouzan, *Cryptography and Network Security*, Tata McGraw-Hill. 2007, (ISBN:978-00-706-6046-5)

**REFERENCE BOOKS:**

1. Bernard Menezes, *Network Security And Cryptography*, Cengage Learning, 2010 (ISBN : 978-81-315-1349).
2. Schneier B., *Applied Cryptography*, 2nd Edition, Wiley & Sons. 2002, (ISBN: 0-471-11709-9).
3. Kaufman C., Perlman R. and Speciner M., *Network Security: Private communication in Public World*, 2nd Edition, Prentice-Hall, 2002, (ISBN: 978-01-304-6019-6)

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year II Sem.

VCE-R18

**MOBILE COMPUTING**  
(Program Elective – III)

Course Code: B4259

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

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

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

**UNIT - II**

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

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

**UNIT - III**

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

**UNIT - IV**

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

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

**UNIT - V**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year II Sem.

VCE-R18

**INFORMATION RETRIVAL SYSTEMS**

(Program Elective – IV)

Course Code: B4260

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**INTRODUCTION TO INFORMATION RETRIEVAL SYSTEMS:** Definition, Objectives, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses. **INFORMATION RETRIEVAL SYSTEM CAPABILITIES:** Search, Browse and Miscellaneous.

**CATALOGING AND INDEXING:** Objectives, Indexing Process, Automatic Indexing, Information Extraction.

**DATA STRUCTURES:** Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hidden Markov Models.

**UNIT - II**

**AUTOMATIC INDEXING:** Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.

**DOCUMENT AND TERM CLUSTERING:** Introduction, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

**UNIT -III**

**USER SEARCH TECHNIQUES:** Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the Internet and Hypertext.

**INFORMATION VISUALIZATION:** Introduction, Cognition and Perception, Information Visualization Technologies.

**TEXT SEARCH ALGORITHMS:** Introduction, Software Text Search Algorithms, Hardware Text Search Systems.

**UNIT - IV**

**INFORMATION SYSTEM EVALUATION:** Introduction, Measures used in System Evaluation, Measurement Example -TREC results.

**UNIT - V**

**MULTIMEDIA INFORMATION RETRIEVAL:** Models and Languages, Data Modeling Query Languages, Indexing and Searching.

**LIBRARIES AND BIBLIOGRAPHICAL SYSTEMS:** Online IR Systems, OPACs, Digital Libraries.

**TEXT BOOKS:**

1. Gerald J. Kowalski, Mark T. Maybury (2000), Information Storage and Retrieval Systems: Theory and Implementation, 2<sup>nd</sup> edition, Springer International Edition, USA.
2. Ricardo Baeza Yates, Berthier Ribeiro Neto (2009), Modern Information Retrieval, Pearson Education, India.

**REFERENCE BOOKS:**

1. Robert R. Korfhage (1997), Information Storage and Retrieval, John Wiley & Sons, India Edition, India.
2. Frakes W. B, Ricardo Baeza Yates (1992), Information Retrieval Data Structures and Algorithms, Pearson Education / Prentice Hall of India, New Delhi, India.

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year II Sem.

VCE-R18

**MACHINE LEARNING**  
(Program Elective – IV)

Course Code: B4261

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

**INTRODUCTION:** Well- posed learning problems, designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias. **DECISION TREE LEARNING:** Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

**UNIT - II**

**ARTIFICIAL NEURAL NETWORKS:** Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition Advanced topics in artificial neural networks. **EVALUATION HYPOTHESES:** Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms. **BAYESIAN LEARNING:** Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, an example learning to classify text, Bayesian belief networks The EM algorithm.

**UNIT - III**

**COMPUTATIONAL LEARNING THEORY:** Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning Instance Based Learning-Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning Genetic Algorithms–Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

**UNIT - IV**

**LEARNING SETS OF RULES:** Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution Analytical Learning Introduction, learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation Based Learning of Search Control Knowledge.

**UNIT - V**

**COMBINING INDUCTIVE AND ANALYTICAL LEARNING:** Motivation, Inductive Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators.

**TEXT BOOKS:**

1. Machine Learning Tom M. Mitchell, MGH 2. *Machine Learning: An Algorithmic Perspective*, Stephen Marsland, Taylor & Francis (CRC)

**REFERENCE BOOKS:**

1. Richard o. Duda, Peter E. Hart and David G. Stork, *Pattern classification*, John Wiley & Sons Inc., 2001  
William WHsieh, *Machine Learning Methods in the Environmental Sciences*, Neural Networks, Cambridge Univ Press.
2. Chris Bishop, *Neural Networks for Pattern Recognition*, Oxford University Press, 1999

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year II Sem.

VCE-R18

**DESIGN PATTERNS**  
(Program Elective – IV)

Course Code: B4262

L	P	C
3	0	3

**SYLLABUS**

**UNIT-I**

**INTRODUCTION:** What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

**UNIT-II**

**A CASE STUDY:** Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary .

**UNIT - III**

**CREATIONAL PATTERNS:** Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

**STRUCTURAL PATTERN PART-I:** Adapter, Bridge, Composite.

**STRUCTURAL PATTERN PART-II:** Decorator, açade, Flyweight, Proxy.

**UNIT - IV**

**BEHAVIORAL PATTERNS PART-I:** Chain of Responsibility, Command, Interpreter, Iterator. Behavioral Patterns Part-II: mediator, Memento, Observer.

**UNIT - V**

**BEHAVIORAL PATTERNS PART-II (cont'd):** State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

What to Expect from Design Patterns,

**TEXT BOOKS:**

1. Design Patterns by Erich Gamma, Pearson Education

**REFERENCES BOOKS:**

1. Pattern's in JAVA Vol-I by Mark Grand, Wiley DreamTech.
2. Pattern's in JAVA Vol-II by Mark Grand, Wiley DreamTech.
3. JAVA Enterprise Design Patterns Vol-III by Mark Grand, Wiley DreamTech.
4. Head First Design Patterns by Eric Freeman-Oreilly-spd
5. Design Patterns Explained by Alan Shalloway, Pearson Education.
6. Pattern Oriented Software Architect ure, F. Buschmann & others, John Wiley & Sons



**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year II Sem.

VCE-R18

**ADVANCED ALGORITHMS LABORATORY**

Course Code: B4207

L	P	C
0	4	2

**LIST OF EXPERIMENTS**

1. Write a program to implement the following sorting algorithms, measure and compare their time complexities.
  - a) Quick sort
  - b) Merge sort
  - c) Insertion sort
2. Write a program for matrix multiplication of two matrices
  - a) Conventional matrix multiplication
  - b) Stassen's matrix multiplicationCompare the time complexities of both algorithms and fix the time difference boundary.
3. Write a program to find out minimum and maximum values of a list with more than 1000 elements using iterative and DandC methods. Compare the time complexities.
4. Write a program to find out the solution vector of knapsack problem using greedy method; consider the profits and weights of more than 10 objects. ( Select the objects based on their profit per unit weight ).
5. Write a program to find the sequence of jobs to maximize the total profit. Where each job is associated deadline and profit, the application will get the profit if a job is completed within it's dead line. Analyze the execution times of different number of jobs and propose the time complexity. Note: consider the jobs with single unit execution time.
6. Write a program to read a weighted connected graph to find out the minimum distances from a given vertex to all other vertices using dijkstra's algorithm.  
Note: read the weighted graph in the form of matrix. Where the element  $a_{ij}$  represents the cost of edge from  $i^{\text{th}}$  vertex to  $j^{\text{th}}$  vertex.
7. Write a program to solve 0/1 knapsack problem using the following:
  - a) Greedy algorithm
  - b) Dynamic programming algorithm
  - c) Backtracking algorithm
  - d) Branch and bound algorithm.
8. Write a program to read a weighted connected graph to find out the minimum distance between each pair of vertices (All pair shortest paths). Find its time complexity.  
Note: read the weighted graph in the form of matrix. Where the element  $a_{ij}$  represents the cost of edge from  $i^{\text{th}}$  vertex to  $j^{\text{th}}$  vertex.
9. Find the matrix multiplication of matrices  $A_0, A_1, A_2 \dots A_n$ , to minimize the number of total elementary multiplications.
10. Write a program to read a weighted connected and implement the below graph traversal algorithms
  - a) Depth first search
  - b) Berdth first search.Analyse and find out the space and time complexities.

11. Write a program to read a weighted connected and implement the below spanning tree algorithms.
  - a) Prim's algorithm
  - b) Kruskal algorithmAnalyse and find out the space and time complexities.
  
12. Consider the problem of placing eight queens on an (eight by eight) chess board without attacks. Two queens are said to be attacked each other if they are on the same row, Column or (not necessarily main) diagonal.
  
13. Write a recursive program for the below algorithms using backtracking method and find the time complexities
  - a) Find the chromatic number(number of colors) of a connected graph
  - b) Sum of subsets problem.
  
14. Consider a currency system with coins of decreasing value  $c_1, c_2, c_3, \dots, c_N$  rupees. Give an algorithm that computes
  - a) The minimum number of coins required to give K rupees in change.
  - b) The number of different ways to give K rupees in change.

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE I Year II Sem.

VCE-R18

**CLOUD COMPUTING LABORATORY**

Course Code: B4208

L	P	C
0	4	2

**LIST OF EXPERIMENTS**

1. Software Study – Hadoop.
2. Service Deployment & Usage over cloud.
3. Managing Cloud Computing Recourses.
4. Using cloud characteristics & Service models.
5. With cloud computing as with data breaches it is a quest ion of “When” not “if”,so what can information security professionals do practically to manage security compliance In the cloud.
6. Performance evaluation of service over cloud.
7. Create a “N “ virtual machine in cloud environment .
8. Case Study: Google App Engine , Microsoft Azure.
9. Case Study: Hadoop , Amazon, Aneka.

**REFERENCE BOOKS:**

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, TMHPublications.
2. Cloud Computing: Concepts, Technology & Architecture (The Prentice Hall Service Technology Servicesfrom Thomas Erl).
3. Microsoft System Center Building a Virtualized Network Solution, Second Edition by Nigel Cain, MichelLuescher, Damian Flynn and Alvin Morales.

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE

VCE-R18

**ENGLISH FOR RESEARCH PAPER WRITING**  
(Audit Course)

Course Code: B4911

L	P	C
2	0	0

**SYLLABUS**

**UNIT - I**

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

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

# VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. CSE

VCE-R18

## DISASTER MANAGEMENT

(Audit Course)

Course Code: B4912

L	P	C
2	0	0

### SYLLABUS

#### UNIT - I

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

#### UNIT - II

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

#### UNIT - III

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

#### UNIT - IV

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

#### UNIT - V

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

#### TEXT BOOKS:

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

#### REFERENCE BOOKS:

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

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE

VCE-R18

**SANSKRIT FOR TECHNICAL KNOWLEDGE**  
(Audit Course)

Course Code: B4913

L	P	C
2	0	0

**SYLLABUS**

**UNIT - I**

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

**UNIT - II**

Order Introduction of roots Technical information about Sanskrit Literature

**UNIT - III**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE

VCE-R18

**VALUE EDUCATION**  
(Audit Course– I)

Course Code: B4914

L	P	C
2	0	0

**SYLLABUS**

**UNIT - I**

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

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

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

**TEXT BOOKS:**

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

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE

VCE-R18

**CONSTITUTION OF INDIA**

(Audit Course)

Course Code: B4915

L P C

2 0 0

**SYLLABUS**

**UNIT - I**

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

**UNIT - II**

**PHILOSOPHY OF THE INDIAN CONSTITUTION:** Preamble, Salient Features

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS**

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



**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE

VCE-R18

**PEDAGOGY STUDIES**  
(Audit Course)

Course Code: B4916

L	P	C
2	0	0

**SYLLABUS**

**UNIT - I**

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

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

# VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. CSE

VCE-R18

## STRESS MANAGEMENT BY YOGA

(Audit Course)

Course Code: B4917

L	P	C
2	0	0

### SYLLABUS

#### UNIT - I

Definitions of Eight parts of yoga. (Ashtanga)

#### UNIT - II

Yam and Niyam.

Do's and Don'ts in life.

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

#### UNIT - III

Asan and Pranayam

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

#### REFERENCE BOOKS:

1. 'Yogic Asanas for Group Training-Part-I' :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata.

# VARDHAMAN COLLEGE OF ENGINEERING

(AUTONOMOUS)

M. Tech. CSE

VCE-R18

## PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

(Audit Course)

Course Code: B4918

L	P	C
2	0	0

### SYLLABUS

#### UNIT - I

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

#### UNIT -II

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

#### UNIT - III

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

#### REFERENCE BOOKS:

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

**SYLLABI FOR  
II YEAR I SEMESTER**

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE II Year I Sem.

VCE-R18

**HUMAN COMPUTER INTERACTION**  
(Program Elective – V)

Course Code: B4263

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

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

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

**UNIT - II**

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

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

**UNIT - III**

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

**UNIT - IV**

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

**SOFTWARE TOOLS:** Specification methods, interface – Building Tools.

**UNIT - V**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE II Year I Sem.

VCE-R18

**COMPUTER GRAPHICS**  
(Program Elective – V)

Course Code: B4264

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

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

**UNIT - II**

**OUTPUT PRIMITIVES:** Points and lines, Line drawing, Midpoint circle and Ellipse Algorithms. Filled area primitives -scan line polygon fill algorithm, boundary fill and flood fill algorithms.

**UNIT - III**

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

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

**UNIT - IV**

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

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

**3D - OBJECT REPRESENTATION:** Polygon surfaces, quadric surfaces, splinere presentation, Hermitecurve, Beziercurve and B-spline curves, Bezier and B-spline surfaces.

**UNIT - V**

**VISIBLE SURFACE DETECTION METHODS:** classifications back faced etection, depth buffer, scan line and depth sorting.

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

**TEXT BOOKS:**

1. Donald Hearn, M. Pauline Baker, Warren Carithers (2014), "Computer Graphics with Open GL", 4<sup>th</sup> Edition, Pearson Education, India.
2. Donald Hearn, M. Pauline Baker (2011), "Computer Graphics with Open GL", 3rd edition, Pearson Education, India.

**REFERENCE BOOKS:**

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

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE II Year I Sem.

VCE-R18

**BUSINESS ANALYTICS**  
(Open Elective)

Course Code: B4901

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

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

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOKS**

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

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE II Year I Sem.

VCE-R18

**INDUSTRIAL SAFETY**  
(Open Elective)

Course Code: B4902

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

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

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOKS**

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

**REFERENCE BOOKS:**

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



**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE II Year I Sem.

VCE-R18

**OPERATIONS RESEARCH**  
(Open Elective)

Course Code: B4903

<b>L</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>3</b>

**SYLLABUS**

**UNIT - I**

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

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

**VARDHAMAN COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

M. Tech. CSE II Year I Sem.

VCE-R18

**WASTE TO ENERGY**  
(Open Elective)

Course Code: B4904

L	P	C
3	0	3

**SYLLABUS**

**UNIT - I**

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

**UNIT - II**

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

**UNIT - III**

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

**UNIT - IV**

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

**UNIT - V**

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

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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