

**ACADEMIC REGULATIONS  
PROGRAM STRUCTURE  
AND  
DETAILED SYLLABUS**

**COMPUTER SCIENCE AND ENGINEERING**

**FOR  
CHOICE BASED CREDIT SYSTEM (CBCS) BASED  
M.TECH TWO YEAR DEGREE PROGRAM  
(Applicable for the batches admitted from the AY 2018-19)**



**Geethanjali College of Engineering and Technology  
(Autonomous)**

**Cheeryal (V), Keesara (M), Medchal Dist., Telangana – 501 301.**

**GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY****(Autonomous)****Cheeryal (V), Keesara (M), Medchal Dist., Pin Code: 501 301****DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING****TABLE OF CONTENTS:**

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**Geethanjali College of Engineering and Technology  
Cheeryal (V), Keesara (M), Medchal Dt., Telangana, 501301**

**Academic Regulations of M.Tech (CSE) Programme, 2018-19 (AR18)**

(Effective for the students admitted into I year from the Academic Year 2018-19 and onwards) (CBCS)

**1.0 Post-Graduate Degree Programme (PGP) in M.Tech**

GCET offers Two-Year (Four-Semester) full-time Master of Technology (M.Tech) Degree Programme in Computer Science and Engineering, under Choice Based Credit System (CBCS).

**2.0 Eligibility for Admissions**

**2.1** Admission to the PGP shall be made subject to eligibility, qualification and specializations prescribed by the GCET from time to time.

**2.2** Admission to the post graduate programme shall be made on the basis of either the merit rank or Percentile obtained by the qualified student in the relevant qualifying GATE Examination / the merit rank obtained by the qualified student in an entrance test conducted by Telangana State Government (PGECET) for M.Tech programme / on the basis of any other exams approved by the University, subject to reservations as laid down by the Govt. from time to time.

**2.3** The medium of instruction for all Post-Graduate (PG) Programmes shall be **ENGLISH** only.

**3.0 M.Tech Programme Structure**

**3.1** The M.Tech Programme is of Semester pattern, with Four Semesters consisting of Two academic years, each academic year having Two Semesters (First / Odd and Second / Even Semesters). Each Semester shall be of 20 weeks duration (inclusive of Examinations), with a minimum of 90 working days.

**3.2** The student shall not take more than four academic years to fulfill all the academic requirements for the award of M.Tech degree from the date of commencement of first year first semester, failing which the student shall forfeit the seat in M.Tech programme.

**3.3** UGC / AICTE specified definitions / descriptions are adopted appropriately for various terms and abbreviations used in these PG academic regulations, as listed below:

**3.3.1 Semester Scheme**

Each Semester shall have 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) are taken as 'references' for the present set of Regulations. The term 'COURSE' refers to 'Theory Course', or 'Lab Course', or 'Design / Drawing Course', or 'Seminar', or 'Comprehensive Viva', or 'Project', or 'Technical Paper Writing' as the case may be.

**3.3.2 Credit Courses**

All courses are to be registered by the student in a semester to earn credits which shall be assigned to each course in an L: P: C (Lecture Periods: Practical Periods: Credits) structure based on the following general pattern:

- One credit for one hour / week / semester for theory / lecture (L) courses
- One credit for two hours / week / semester for laboratory/ practical (P) courses

- Other student activities like study tour, guest lecture, conference/workshop participations, technical paper presentations, and identified mandatory courses, if any, shall not carry credits.

### 3.3.3 Course Classification

All courses offered for the Post-Graduate (M.Tech Degree) Programme are broadly classified as follows. GCET has followed in general the guidelines issued by AICTE / UGC.

S.No.	Broad Course Classification	Course Group/ Category	Course Description
1	Core Courses (CoC)	PC- Professional Core	Includes subjects related to the parent discipline/department/ branch of Engineering
		Project Work	M.Tech Project or PG Project or Major Project
		Seminar, Technical Paper Writing	Seminar/Colloquium based on core contents related to parent discipline/department/branch of Engineering
		Comprehensive Viva-Voce	Viva-voce covering all the PG subjects studied during the course work and related aspects
2	Elective Courses (EIE)	PE - Professional Electives	Includes elective subjects related to the parent discipline/department/branch of Engineering
		OE - Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline/department/branch of Engineering
<b>Total number of Credits</b>			

## 4.0 Course Registration

- 4.1 A 'Faculty Advisor or Counselor' shall be assigned to each specialization, who will advise on the Post Graduate Programme (PGP), its Course Structure and Curriculum, Choice / Option for Courses, based on his competence, progress, pre-requisites and interest.
- 4.2 The Academic Section of the College invites 'Registration Forms' from students within 15 days from the commencement of class work. The Registration Requests for any 'SEMESTER' shall be completed BEFORE the commencement of SEEs of 'PRECEDING SEMESTER'.
- 4.3 A Student can apply for Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor and the Student).
- 4.4 If the Student submits ambiguous choices or multiple options or erroneous entries during Registration for the Course(s) under a given / specified Course Group / Category as listed in the Course Structure, only the first mentioned Course in that Category will be taken into consideration.
- 4.5 Course Options exercised through Registration are final and CANNOT be changed, nor can they be interchanged; further, alternate choices also will not be considered. However,

if the Course that has already been listed for Registration by the GCET in a Semester could not be offered due to unforeseen or unexpected reasons, then the Student will be allowed to have alternate choice either for a new Subject, if it is offered, or for another existing course (subject to availability of seats). Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

#### **5.0 Attendance Requirements**

The programmes are offered on the basis of a unit system with each course being considered a unit.

**5.1** Attendance in all classes (Lectures / Laboratories / Mini project with Seminar / audit courses) is compulsory. The minimum required attendance in each course including the attendance of mid-term examination / Laboratory etc. is 75%. Two periods of attendance for each theory course shall be considered, if the student appears for the mid-term examination of that course. A student shall not be permitted to appear for the SEE, if his attendance is less than 75%.

**5.2** A student's seminar report and seminar presentation shall be eligible for evaluation, only if he ensures a minimum of 75% of his attendance in seminar presentation classes during that semester.

**5.3** **Condoning of shortage of attendance** (between 65% and 75%) up to a maximum of 10% (considering the days of attendance in sports, games, NCC, NSS activities and Medical grounds) in each course of a semester shall be granted by the College Academic Committee (CAC).

**5.4** Shortage of attendance below 65% in any course shall in 'NO' case be condoned.

**5.5** A Student, whose shortage of attendance is not condoned in any course(s) in any semester, is considered detained in that course(s) and is not eligible to write Semester End Examination(s) of such course(s) in that semester, and he has to seek re-registration for those course(s) in subsequent semesters, and attend the same as and when offered.

**5.6** A student who fulfills the attendance requirement in the present semester shall not be eligible for readmission into the same class (cannot register for all courses of the same semester).

**5.7** A prescribed fee per course shall be payable for condoning shortage of attendance.

**5.8** A student shall put in a minimum required attendance in at least three theory courses in I Year I semester for promotion to I Year II Semester.

#### **6.0 Academic Requirements**

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in section 5. The performance of the student in each semester shall be evaluated course-wise, with a maximum of 100 marks per course (theory / practical), on the basis of CIE and SEE.

**6.1** A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if he secures not less than 40% of marks (28 out of 70 marks) in the SEE, and a minimum of 50% of marks in the sum total of CIE and SEE taken together; in terms of Letter Grades, this implies securing 'B' Grade or above in a course.

- 6.2** A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to a course, if he secures not less than 50% of the total marks. The student is deemed to have failed, if he does not present the mini project with seminar as required. In such a case, he shall re-register for mini project with seminar, in the subsequent semester, as and when scheduled.
- 6.3** A student shall register for all courses for a total of 68 credits as specified and listed in the Programme structure, put in required attendance and fulfill the academic requirements for securing 68 credits, obtaining a minimum of 'B' Grade or above in each course, and all 68 credits securing Semester Grade Point Average (SGPA)  $\geq 6.0$  (in each semester) and final Cumulative Grade Point Average (CGPA) (i.e., CGPA at the end of PGP)  $\geq 6.0$ , to complete the PGP successfully.
- Note:** (1) **The SGPA shall be computed and printed on the memorandum of grades only if the student passes all the courses offered and gets a minimum B grade in all the courses.**
- (2) **CGPA is calculated only when the student passes all the courses offered in all the semesters.**
- 6.4** Letter Grades, as specified in section 9.0, obtained in all those courses covering the above specified 68 credits alone shall be considered for the calculation of final CGPA, which shall be indicated in the Grade Card of second year second semester.
- 6.5** If a student registers for extra course(s) (in the parent department or other departments/branches of Engineering) other than those listed courses totaling to 68 credits as specified in the programme structure, the performance in extra course(s) (although evaluated and graded using the same procedure as that of the required 68 credits) shall not be taken into account while calculating the SGPA and CGPA. For such extra course(s) registered, Letter Grade alone shall be indicated in the Grade Card, as a performance measure, subject to completion of the attendance and academic requirements as stated in sections 5 and 6.1 - 6.3.
- 6.6** When a student is detained due to shortage of attendance in any course(s) in any semester, no Grade allotment shall be made for such course(s). However, he is eligible for re-registration of such course(s) in the subsequent semester(s), as and when next offered, with the academic regulations of the batch into which he is re-registered, by paying the prescribed fees per course. In all these re-registration cases, the student shall have to secure a fresh set of internal marks and Semester End Examination marks for performance evaluation in such course(s), and SGPA / CGPA calculations.
- 6.7** A student eligible to appear for the Semester End Examination in any course, but absent from it or failed (failing to secure 'B' Grade or above), may reappear for that course at the supplementary examination as and when conducted. In such cases, his Internal Marks assessed earlier for that course shall be carried over, and added to the marks secured in the supplementary examination, for the purpose of evaluating his performance in that course.
- 6.8** A Student who fails to earn 68 credits as per the specified programme structure, and as indicated above, within four academic years from the date of commencement of his first year first semester, shall forfeit his seat in M.Tech programme and his admission shall stand cancelled.

## 7.0 Evaluation - Distribution and Weightage of Marks

The performance of a student in each semester shall be evaluated course-wise (irrespective of credits assigned) for a maximum of 100 marks. The M. Tech project work (major project) shall also be evaluated for 100 marks. For theory courses, 70 marks shall be awarded for the performance in the SEE and 30 marks shall be awarded for CIE which consists of two mid-term examinations (for 25 marks) and assignments (for 5 marks). First Mid-Term examinations shall be conducted in the middle of the Semester and second Mid-Term examinations immediately after the last week of instruction. The CIE shall be the average of the marks secured in the two Mid-Term Examinations conducted including assignment marks secured.

**7.1** For theory courses, during the semester, there shall be TWO (2) mid-term examinations for 25 marks each.

**7.1.1** For each mid-term examination, question paper consists of two parts:

- Part–A for 10 marks (Compulsory);
- Part–B for 15 marks;
- Part–A: Part–A consists of five questions, two from each unit or part thereof of the prescribed syllabus of the course. Each question carries 2 marks. All questions are compulsory.
- Part–B: Part–B consists of five questions, two from each unit or part thereof of the prescribed syllabus of the course. Each question carries five (5) marks and may contain sub-questions and the student shall answer any three questions.
- The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.
- The first set of assignments shall be submitted before the conduct of the first mid-term examinations, and the second set of assignments shall be submitted before the conduct of the second mid-term examinations. The assignments shall be as specified by the course instructor concerned.

**7.1.2** The SEE shall be conducted for 70 marks.

The question paper consists of two parts:

- Part–A for 20 marks (Compulsory);
- Part–B for 50 marks (Questions with Internal Choice);
- Part–A: Part–A consists of five questions, one from each unit of the prescribed syllabus of the course. Each question carries 4 marks. All questions are compulsory.
- Part–B: Part–B consists of five questions, one each from the five units of the prescribed syllabus of the course. Each question carries 10 marks and may contain sub-questions. For each question, there shall be an internal choice (it means, there shall be two questions from each unit, and the student shall answer either of the questions). The student shall answer all the questions of Part–B.

**7.2** For practical / laboratory courses, 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.

**7.3** In laboratory / practical courses, for conducting SEE, one internal examiner and one external examiner shall be appointed by the Chief Superintendent of Examinations of the

- college as per the recommendation of the Chairperson, Board of Studies of the department concerned. The panel of the external examiners shall be provided by the Chairperson, BoS at the commencement of the semester during the meeting of the BoS.
- 7.4** There shall be a mini project with seminar presentation during I year II semester. Towards this, student shall carry out a mini project, executes / implements the same, prepares a report of the same and presents it as a seminar towards the end of I year II semester, which shall be evaluated by a committee consisting of Head of the Department, mini project supervisor, mini project-seminar coordinator and one senior faculty member of the department. For mini Project-seminar, there shall be only continuous internal evaluation for 100 marks, of which the supervisor shall evaluate the work for the 50 marks. A student shall secure a minimum of 50% of marks to be declared successful. If he fails to obtain the minimum marks, he shall re-register for the same, during the next semester as and when conducted, subject to section 3.2. There is no SEE for mini project with seminar.
- 7.5** Every student shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee (PRC).
- 7.6** PRC shall be constituted with the Head of the Department as Chairperson, Project Supervisor and one senior faculty member of the Department offering the M. Tech programme.
- 7.7** Registration of Project Work: A student is permitted to register for the project work after satisfying the attendance requirement in all the courses, both theory and practicals.
- 7.8** After satisfying 7.7, a student has to present the following in Project Work Review I (Project / Dissertation Phase-I), in consultation with his Project Supervisor: the title of the project work which shall be carried out, objective and plan of action of his project work to the PRC for approval within four weeks from the commencement of Second year First Semester. Only after obtaining the approval of the PRC, the student shall initiate the Project work.
- 7.9** If a student 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.
- 7.10** A student shall submit his project progress report in two stages at least with a gap of three months between them.
- 7.11** The work on the project shall be initiated at the beginning of the II year and the duration of the project is two semesters. A student 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 student shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.
- 7.12** The Project Work Review II (Project / Dissertation Phase-I) in II Year I Semester carries internal marks of 100. Evaluation shall be done by the PRC for 50 marks and the Supervisor shall evaluate the work for the other 50 marks. The Supervisor and PRC shall examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain and progress of the Project Work. A student has to secure a minimum of

- 50% of marks to be declared successful in Project Work Review II. If he fails to obtain the minimum required marks, he has to reappear for Project Work Review-II as and when conducted.
- 7.13** The Project Work Review III (Project / Dissertation Phase-II) in II Year II Semester carries 100 internal marks. Evaluation should be done by the PRC for 50 marks and the Supervisor shall evaluate the work for the other 50 marks. The PRC shall examine the overall progress of the Project Work and decide whether or not the Project is eligible for final submission. A student 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 final Project Evaluation (Viva Voce) in II Year II Semester there are external marks of 100 and it is evaluated by the external examiner. The student has to secure a minimum of 50% marks in Project Evaluation (Viva-Voce) examination.
- 7.14** The unsuccessful students in Project Work Review II (Phase I) shall reappear for it at the time of Project Work Review III (Phase II) in the second year second semester. These students shall appear for Project Work Review III in the subsequent semester (next academic year) only after completion of Project Work Review II. The unsuccessful students in Project Work Review III (Phase II) shall reappear for Project Work Review III in the next semester only.
- 7.15** After approval from the PRC (after successful completion of project work review–II and project work review–III), a soft copy of the thesis shall be submitted to the department for ANTI-PLAGIARISM check. The department shall facilitate to carry out the anti-plagiarism check and the report generated shall be included in the final thesis. The Thesis shall 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 shall be limited to TWO.
- 7.15.1** In case, a student fails to fulfill the plagiarism check as mentioned in section 7.15, the student shall re-register for the project work and work for two more semesters and successfully completes the project work subject to the condition that he completes his degree within the stipulated period of four years from the date of his first admission into the M.Tech programme.
- 7.16** 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 a Scopus Indexed / UGC approved journal. A copy of the submitted research paper shall be attached to thesis.
- 7.17** The thesis shall be adjudicated by an external examiner appointed by the Chief Superintendent of Examinations of the college as per the recommendation of the Chairperson, Board of Studies of the department concerned. The panel of the external examiners shall be provided by the Chairperson, BoS.
- 7.18** If the report of the external examiner is unsatisfactory, the student shall revise and resubmit the thesis. If the report of the examiner is unsatisfactory again, the thesis shall be summarily rejected. The student shall re-register for the project work and work for two more semesters subject to the condition that he completes his degree within the stipulated time of four years from the date of his first admission into the M.Tech programme.

- 7.19** If the report of the external 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 student has to secure a minimum of 50% of marks in Project Evaluation (Viva-Voce) examination.
- 7.20** If he fails to fulfill the requirements as specified in 7.19, he shall reappear for the Viva-Voce examination only after three months. In the reappeared examination also, if he fails to fulfill the requirements, he shall 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 (within four years from the date of commencement of his first year first semester).

## **8.0 Re-Admission / Re-Registration**

### **8.1 Re-Admission for Discontinued Student**

A student, who has discontinued the M.Tech degree programme due to any reason whatsoever, may be considered for 'readmission' into the same degree programme (with the same specialization) with the academic regulations of the batch into which he gets readmitted, with prior permission from the authorities concerned, subject to sections 3.2 and 6.6.

- 8.2** If a student is detained in a course(s) due to shortage of attendance in any semester, he may be permitted to re-register for the same course(s) in the same category (core or elective group) or equivalent course, if the same course is not available, as suggested by the Board of Studies of that department, as and when offered in the subsequent semester(s), with the academic regulations of the batch into which he seeks re-registration, with prior permission from the authorities concerned, subject to section 3.2.
- 8.3** A student shall be given one chance to re-register for a maximum of two courses, if the internal marks secured by a student are less than 50% and failed in those courses. A student must re-register for failed courses within four weeks of commencement of the class work and secure the required minimum attendance. In the event of the student exercising this choice, his CIE (internal) marks and SEE marks obtained in the previous attempt stand cancelled.

## **9.0 Examinations and Assessment - The Grading System**

- 9.1** Grades shall be awarded to indicate the performance of each student in each Theory Course, or Lab / Practicals, or Seminar, or Technical Paper Writing or Project, etc., based on the % of marks obtained in CIE + SEE (both taken together) as specified in Section 7 above, and a corresponding Letter Grade shall be given.
- 9.2** As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
90% and above ( $\geq 90\%$ , $\leq 100\%$ )	O (Outstanding)	10
Below 90% but not less than 80% ( $\geq 80\%$ , $< 90\%$ )	A <sup>+</sup> (Excellent)	9
Below 80% but not less than 70% ( $\geq 70\%$ , $< 80\%$ )	A (Very Good)	8
Below 70% but not less than 60% ( $\geq 60\%$ , $< 70\%$ )	B <sup>+</sup> (Good)	7
Below 60% but not less than 50% ( $\geq 50\%$ , $< 60\%$ )	B (above Average)	6
Below 50% ( $< 50\%$ )	F (FAIL)	0
<b>Absent</b>	<b>Ab</b>	<b>0</b>

- 9.3** A student obtaining F Grade in any Course is deemed to have ‘failed’ and is required to reappear as ‘Supplementary Student’ for the SEE, as and when conducted. In such cases, his CIE (Internal) Marks in those courses shall remain as obtained earlier.
- 9.4** If a student has not appeared for the examinations, ‘Ab’ Grade shall be allocated to him for any course and shall be considered ‘failed’ and shall be required to reappear as ‘Supplementary Student’ for the SEE, as and when conducted.
- 9.5** A Letter Grade does not imply any specific marks percentage; it is only the range of percentage of marks.
- 9.6** In general, a student shall not be permitted to repeat any Course(s) only for the sake of ‘Grade Improvement’ or ‘SGPA / CGPA Improvement’.
- 9.7** A student earns Grade Point (GP) in each Course, on the basis of the Letter Grade obtained by him in that Course. The corresponding ‘Credit Points’ (CP) are computed by multiplying the Grade Point with Credits for that particular Course.

**Credit Points (CP) = Grade Point (GP) x Credits .... For a Course**

- 9.8** The student passes the Course only when he gets **GP  $\geq 6$  (B Grade or above)**.
- 9.9** The SGPA is calculated by dividing the Sum of Credit Points ( $\Sigma$ CP) secured from ALL Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$$\text{SGPA} = \{ \sum_{i=1}^N C_i G_i \} / \{ \sum_{i=1}^N C_i \} \dots \text{For each Semester,}$$

where ‘i’ is the course indicator index (taking into account all Courses in a Semester), ‘N’ is the no. of Courses ‘REGISTERED’ for the Semester (as specifically required and listed under the Course Structure of the parent Department),  $C_i$  is the no. of Credits allotted to the  $i^{\text{th}}$  Course, and  $G_i$  represents the GP corresponding to the Letter Grade awarded for that  $i^{\text{th}}$  Course.

- 9.10** The CGPA is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points

secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

$$\text{CGPA} = \{ \sum_{j=1}^M C_j G_j \} / \{ \sum_{j=1}^M C_j \} \dots \text{for all S Semesters registered (ie., upto and inclusive of S Semesters, } S \geq 2),$$

where ‘M’ is the TOTAL no. of Courses (as specifically required and listed under the Course Structure of the parent Department) the Student has ‘REGISTERED’ for from the 1<sup>st</sup> Semester onwards up to and inclusive of the Semester S ( obviously  $M > N$  ), ‘j’ is the Course indicator index (taking into account all Courses from 1 to S Semesters),  $C_j$  is the no. of Credits allotted to the  $j^{\text{th}}$  Course, and  $G_j$  represents the Grade Points (GP) corresponding to the Letter Grade awarded for that  $j^{\text{th}}$  Course. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

**Illustration of calculation of SGPA**

Course/Subject	Credits	Letter Grade	Grade points	Credit Points
Course 1	4	A	8	4*8 = 32
Course 2	4	O	10	4*10 = 40
Course 3	4	B	6	4*6 = 24
Course 4	3	B	6	3*6 = 18
Course 5	3	A+	9	3*9 = 27
Course 6	3	B	6	3*6 = 18
	21			159

$$\text{SGPA} = 159/21 = 7.57$$

**Illustration of calculation of CGPA**

Semester	Credits	SGPA	Credits * SGPA
Semester I	24	7	24*7 = 168
Semester II	24	6	24*6 = 144
Semester III	24	6.5	24*6.5 = 156
Semester IV	24	6	24*6 = 144
	96		612

$$\text{CGPA} = 612/96 = 6.37$$

**10.0 Award of Degree and Class**

**10.1** If a student who registers for all the specified Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme, and secures the required number of 68 Credits (with  $\text{CGPA} \geq 6.0$ ), shall be declared to have ‘QUALIFIED’ for the award of the M.Tech Degree in Computer Science and Engineering that he was admitted into.

**10.2 Award of Class**

After a student has earned the requirements prescribed for the completion of the programme and is eligible for the award of M.Tech Degree, he shall be placed in one of the following three classes based on the CGPA:

Class Awarded	CGPA
First Class with Distinction	$\geq 7.75$
First Class	$6.75 \leq \text{CGPA} < 7.75$
Second Class	$6.00 \leq \text{CGPA} < 6.75$

A student with final CGPA (at the end of the PGP)  $< 6.00$  shall not be eligible for the Award of Degree.

**11.0 Withholding of Results**

If the student has not paid the dues, if any, to the GCET or if any case of indiscipline is pending against him, the result and degree of the student shall be withheld and he shall not be allowed into the next semester.

**12.0. Transitory Regulations**

**12.1** A student who has been detained in any semester of I Year of AR16 Regulations of GCET due to lack of attendance, shall be permitted to join the same semester of I Year of AR18 Regulations and is required to complete the study of M.Tech programme within the stipulated period of four academic years from the date of first admission in I Year I semester. The AR18 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester.

**12.2** Student detained due to shortage of attendance in one or more courses is eligible for reregistration of maximum of two earlier or equivalent courses at a time as and when offered.

**12.3 For all students readmitted under AR18 Regulations of GCET:**

**12.3.1** A student who has failed in any course(s) under any regulation has to pass those course(s) in the same regulations.

**12.3.2** If a student readmitted into AR18 Regulations has any course(s) to be studied in the semester of his re-admission or succeeding semesters with about 80% of the syllabus in common with course(s) he has studied under his previous regulations, that particular course(s) shall be substituted for by another course(s) by the college (see also section 12.3.3).

**12.3.3** If a student taking readmission as per the provisions of section 12.3.1 had not studied in his previous semesters, any course(s) which is/are prescribed for study under AR18 Regulations (in any of the semester(s) preceding the semester of re-admission), he shall pass all such course(s) to meet the academic requirements of AR18 Regulations. One or more of these course(s) may be offered as substitute course(s), as per section 12.3.2. Other course(s), not offered as substitute course(s), shall constitute **Additional Course(s)**, which the student must pass to meet the academic requirements for the award of the degree. *Method of evaluation of additional courses shall be the same as the one detailed in section 7.* The college may conduct remedial classes and internal examinations for the benefit of the student. The Academic Regulations of GCET, AR18,

under which a student has been readmitted, shall be applicable to the student from that semester.

- 12.4** The student who fails in any course under AR16 regulations shall be given two chances to pass the same course in the same regulations; otherwise, he has to identify an equivalent course and fulfill the attendance and academic requirements of that course as per AR18 Academic Regulations.
- 12.5** For student readmitted to AR18 Regulations, the maximum credits that a student acquires for the award of the degree, shall be the sum of the total number of credits secured in AR16 regulations of his study including AR18 Regulations.
- 13.0 General**
- 13.1 Credit:** A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work / field work per week.
- 13.2 Credit Point:** It is the product of grade point and number of credits for a course.
- 13.3** Wherever the words “he”, “him”, “his”, occur in the regulations, they shall include “she”, “her”.
- 13.4** The words “mid-term” and “internal” are used interchangeably.
- 13.5** The academic regulation should be read as a whole for the purpose of any interpretation.
- 13.6** In case of any doubt or ambiguity in the interpretation of the above rules, the decision of GCET is final.
- 13.7** GCET may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by GCET.

## PUNISHMENT FOR MALPRACTICE

	Nature of Malpractices	Punishment
	<b>If the candidate:</b>	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course 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 candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate 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 course only of all the candidates involved. In case of an outsider, he shall be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he shall be handed over to the police and a case is registered against him.

4	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	Refuses to obey the orders of the Chief Superintendent / Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, 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.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they shall be handed over to the police and a police case is registered against them.

7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate 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 course and all other courses the candidate 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 candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College shall be handed over to police and, a police case shall be registered against them.

**Geethanjali College of Engineering And Technology (Autonomous)  
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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**M.Tech. Program in Computer Science and Engineering**

**VISION OF THE INSTITUTE**

Geethanjali visualizes dissemination of knowledge and skills to students, who would eventually contribute to well being of the people of the nation and global community.

**MISSION OF THE INSTITUTE**

1. To impart adequate fundamental knowledge in all basic sciences and engineering, technical and Inter-personal skills to students.
2. To bring out creativity in students that would promote innovation, research and entrepreneurship.
3. To Preserve and promote cultural heritage, humanistic and spiritual values promoting peace and harmony in society.

**VISION OF THE DEPARTMENT**

To produce globally competent and socially responsible computer science engineers contributing to the advancement of engineering and technology which involves creativity and innovation by providing excellent learning environment with world class facilities.

**MISSION OF THE DEPARTMENT**

1. To be a center of excellence in instruction, innovation in research and scholarship and service to the stake holders, the profession, and the public.
2. To prepare graduates to enter rapidly changing field as a competent computer science engineer.
3. To prepare graduates capable in all phases of software development, possess a firm understanding of hardware technologies, have the strong mathematical background necessary for scientific computing, be sufficiently well versed in general theory and practice to allow growth within the discipline as it advances.
4. To prepare graduates to assume leadership roles by possessing good communication skills, ability to work effectively as team members, appreciation for their social and ethical responsibility in a global setting.

**PROGRAM EDUCATION OBJECTIVES (PEOs)**

**PEO-I:** Perform with dominance in scholastics, business, design and development in computing technology, or exploration in a specific area of Computer Science and Engineering to pursue research and an appreciation for lifelong learning.

**PEO-II:** Demonstrate methodically scientific concepts and problem solving skills by applying research principles for effective decision making in handling real life problems within realistic constraints.

**PEO-III:** Ability to convey the scientific exploration or express inventive thoughts in a powerful way with familiarity, social and economic obligation with the support of domain expertise.

**PROGRAM OUTCOMES (POs)**

Students would be able to:

<b>PO 1</b>	Apply knowledge of recent computing technologies, skills and current tools of computer science and engineering.
<b>PO 2</b>	Design and conduct experiments, as well as to analyze and interpret data.
<b>PO 3</b>	Apply knowledge of contemporary research issues in the different areas of computer science & engineering
<b>PO 4</b>	Explore research gaps, analyze and carry out research in the specialized/emerging areas of computer science and engineering.
<b>PO 5</b>	Design software systems, components, or processes to meet identified needs within economic, environmental and social constraints.
<b>PO 6</b>	Express/present ideas in an impressive and professional manner.
<b>PO 7</b>	Recognize the need to engage in lifelong learning through continuing education and research.
<b>PO 8</b>	Work in multidisciplinary and multicultural environment.
<b>PO 9</b>	Become entrepreneur based upon societal needs.
<b>PO 10</b>	Exhibit professional, social and ethical responsibilities.

**Department of CSE**  
**PROGRAM STRUCTURE**

(Applicable for the Batch admitted from the Academic Year 2018-19 onwards)

**I YEAR I SEMESTER**

S.No.	Group Code	Group	Subject	L	T	P	Credits
1.	18MCS101	PC 1	Advanced Data Structures	3	-	-	3
2.	18MCS102	PC 2	Mathematical Foundations of Computer Science	3	-	-	3
3.		PSE 1	Program Specific Elective 1	3	-	-	3
4.		PSE 2	Program Specific Elective 2	3	-	-	3
5.	18MCS1L1	Laboratory1	Advanced Data Structures Lab	-	-	4	2
6.		Laboratory2	Based on Program Specific Electives-1	-	-	4	2
7.	18MCS109	PW	Research Methodology & IPR	2	-	-	2
8.		Audit 1	AUDIT COURSE 1	2	-	-	-
<b>TOTAL CREDITS</b>				<b>16</b>	<b>-</b>	<b>8</b>	<b>18</b>

**Program Specific Elective 1**

1	18MCS103	Machine Learning
2	18MCS104	Cryptography & Network Security
3	18MCS105	Internet of Things

**Program Specific Elective 1 Lab**

1	18MCS1L2	Machine Learning Lab
2	18MCS1L3	Cryptography & Network Security Lab
3	18MCS1L4	Internet of Things Lab

**Program Specific Elective 2**

1	18MCS106	Software Architectures
2	18MCS107	Information Retrieval Systems
3	18MCS108	Distributed Systems

**AUDIT COURSE 1**

1	18MAC101	Indian Constitution
2	18MAC102	Soft Skills

**I YEAR II SEMESTER**

S.No.	Group Code	Group	Subject	L	T	P	Credits
1.	18MCS201	PC 3	Advanced Algorithms	3	-	-	3
2.	18MCS202	PC 4	Soft Computing	3	-	-	3
3.		PSE 3	Program Specific Elective 3	3	-	-	3
4.		PSE 4	Program Specific Elective 4	3	-	-	3
5.	18MCS2L1	Laboratory 3	Advanced Algorithms Lab	-	-	4	2
6.		Laboratory 4	Based on Program Specific Electives-3	-	-	4	2
7.	18MCS201	PW	MINI PROJECT with Seminar	-	-	4	2
8.		Audit 2	AUDIT COURSE 2	2	-	-	-
<b>TOTAL CREDITS</b>				<b>14</b>	<b>-</b>	<b>12</b>	<b>18</b>

**Program Specific Elective 3**

1	18MCS203	Digital Forensics
2	18MCS204	Data Analytics
3	18MCS205	Parallel Computing

**Program Specific Elective 3 Lab**

1	18MCS2L2	Digital Forensics Lab
2	18MCS2L3	Data Analytics Lab
3	18MCS2L4	Parallel Computing Lab

**Program Specific Elective 4**

1	18MCS206	Human Computer Interaction
2	18MCS207	Computer Vision
3	18MCS208	Distributed Databases

**AUDIT COURSE 2**

1	18MAC201	Professional Ethics
2	18MAC202	Disaster Management

**II YEAR I SEMESTER**

S. No	Group Code	Group	Subject	L	T	P	Credits
1.		PSE 5	Program Specific Elective 5	3	-	-	3
2.		OEC	Open Elective	3	-	-	3
3.	18MCS301	PW	PROJECT / DISSERTATION PHASE – I	-	-	20	10
<b>TOTAL CREDITS</b>				<b>6</b>	<b>-</b>	<b>20</b>	<b>16</b>

**Program Specific Elective 5**

1	18MCS302	Optimization Techniques
2	18MCS303	High Performance Computing
3	18MCS304	Ad hoc and Sensor Networks

**OPEN ELECTIVES**

1	18MOE301	Business Analytics
2	18MOE302	Industrial Safety
3	18MOE303	Operations Research
4	18MOE304	Cost Management of Engineering Projects
5	18MOE305	Composite Materials
6	18MOE306	Energy from Waste
7	18MOE307	Power from Renewable Energy Sources

**II YEAR II SEMESTER**

S. No	Group Code	Group	Subject	L	T	P	Credits
1.	18MCS401	PW	PROJECT / DISSERTATION PHASE – II	-	-	32	16
<b>TOTAL CREDITS</b>				<b>-</b>	<b>-</b>	<b>32</b>	<b>16</b>

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**18MCS101 – ADVANCED DATA STRUCTURES**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s):** A Course on Data Structures

**Course Objectives:**

Develop ability to

1. Introduces the heap data structures such as leftist trees, binomial heaps, fibonacci and min-max heaps.
2. Introduces a variety of data structures such as disjoint sets, hash tables, search structures and digital search structures.
3. Master implementation of search structures- OBST, AVL trees, Red-Black trees, Splay trees, Be familiar with basic techniques of algorithm analysis.
4. Master the implementation of linked data structures such as linked lists and binary trees.
5. Be familiar with writing recursive methods

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO1. Ability to select the data structures that efficiently model the information in a problem.
- CO2. Ability to understand how the choice of data structures impact the performance of programs.
- CO3. Can design programs using a variety of data structures, including hash tables, search structures and digital search structures.
- CO4. Analyzing the design adopted for the algorithm.
- CO5. Fundamental concepts of algorithms and analyze the performance of algorithms.

**UNIT-I : Heap Structures**

Introduction, Min-Max Heaps, Leftist trees, Binomial Heaps, Fibonacci heaps.

**UNIT-II : Hashing and Collisions**

Introduction, Hash Tables, Hash Functions, different Hash Functions:- Division Method, Multiplication Method, Mid-Square Method, Folding Method, Collisions

**UNIT-III : Search Structures**

OBST, AVL trees, Red-Black trees, Splay trees, Multiway Search Trees - B-trees., 2-3 trees

**UNIT-IV : Digital Search Structures**

Digital Search trees, Binary tries and Patricia, Multiway Tries, Suffix trees, Standard Tries, Compressed Tries

**UNIT-V : Pattern matching / Files and their organization**

Introduction, Brute force, the Boyer –Moore algorithm, Knuth-Morris-Pratt algorithm, Naïve String , Harspool, Rabin Karp

or

Introduction, Data Hierarchy, File Attributes, Text and Binary files, Basic File operations, File organization- Sequential Organization, Relative File Organization, Indexed Sequential File Organization, Indexing- Ordered Indices, Dense and Sparse Indices, Cylinder Surfaces

**TEXT BOOKS:**

1. Fundamentals of data structures in C++ Sahni, Horowitz, Mehatha, Universities Press.
2. Introduction to Algorithms, TH Cormen, PHI

**REFERENCE BOOKS:**

1. Design methods and analysis of Algorithms, SK Basu, PHI.
2. Data Structures & Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education.
3. Fundamentals of Computer Algorithms, 2<sup>nd</sup> Edition, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Universities Press.

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**18MCS102 – MATHEMATICAL FOUNDATIONS OF COMPUTER  
SCIENCE**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s):** An understanding of Math in general is sufficient

**Course Objectives:**

Develop ability to

1. Introduces the elementary discrete mathematics for computer science and engineering.
2. Topics include formal logic notation, methods of proof
3. Be familiar with sets, relations, functions
4. Be familiar with Algorithms and their complexity ,Induction and recurrence
5. Able to solve counting techniques and graph theory

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Ability to understand and construct precise mathematical proofs
- CO 2: Ability to use logic and set theory to formulate precise statements
- CO 3: Ability to analyze and solve counting problems on finite and discrete structures
- CO 4: Ability to describe and manipulate sequences
- CO 5: Ability to apply graph theory in solving computing problems

**UNIT-I : The Foundations: Logic and Proofs**

Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

**UNIT-II : Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations**

Sets, Functions , Sequences & Summations, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

**UNIT-III : Algorithms, Induction and Recursion**

Algorithms, The Growth of Functions, Complexity of Algorithms.

Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.

**UNIT-IV : Discrete Probability and Advanced Counting Techniques**

An Introduction to Discrete Probability . Probability Theory, Bayes' Theorem, Expected Value and Variance.

**Advanced Counting Techniques:**

Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion-Exclusion, Applications of Inclusion-Exclusion.

**UNIT-V : Graphs, Trees**

Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

**TEXT BOOKS:**

1. Discrete Mathematics and Its Applications with Combinatorics and Graph Theory- Kenneth H Rosen, 7<sup>th</sup> Edition, TMH.
2. Discrete Mathematical Structures with Applications to Computer Science-J.P. Tremblay and R. Manohar, TMH,
3. Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Teodore P. Baker, 2<sup>nd</sup> ed. , Pearson Education.

**REFERENCE BOOKS:**

1. Discrete Mathematics- Richard Johnsonbaugh, 7<sup>th</sup> Edtn., Pearson Education.
2. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.
3. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, 5<sup>th</sup> edition , Pearson Education,.

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**18MCS103 – MACHINE LEARNING**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s):** Data Structures , Knowledge on statistical methods

**Course Objectives:**

Develop ability to

1. This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
2. To understand computational learning theory.
3. To study the pattern comparison techniques.
4. To be able to formulate machine learning problems corresponding to different applications.
5. To understand a range of machine learning algorithms along with their strengths and weaknesses.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Understand the concepts of computational intelligence like machine learning
- CO 2: Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- CO 3: Understand the Neural Networks and its usage in machine learning application.
- CO 4: Student should be we to understand the basic concepts such decision tree and neural networks.
- CO 5: Ability to formulate machine learning techniques to respective problems.

**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.

Discussion on the Back Propagation Algorithm, An illustrative Example: Face Recognition

**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.

**UNIT –III : 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, EM Algorithm.

**Computational Learning Theory** – Introduction, Probably 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 Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

**UNIT –IV : Pattern Comparison Techniques**

Temporal patterns, Dynamic Time Warping Methods, Clustering, Codebook Generation, Vector Quantization

**Pattern Classification:** Introduction to HMMS, Training and Testing of Discrete Hidden Markov Models and Continuous Hidden Markov Models, Viterbi Algorithm, Different Case Studies in Speech recognition and Image Processing

**UNIT –V : Analytical Learning**

Introduction, Learning with Perfect Domain Theories : PROLOG-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operations.

**Combining Inductive and Analytical Learning** – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis.

**TEXT BOOKS:**

1. Machine Learning – Tom M.Mitchell,-MGH
2. Fundamentals of Speech Recognition By Lawrence Rabiner and Biing – Hwang Juang.

**REFERENCE BOOKS:**

1. Machine Learning : An Algorithmic Perspective, Stephen Marsland, Taylor & Francis

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**18MCS104 – CRYPTOGRAPHY & NETWORK SECURITY**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s):** A Course on “Computer Networks

**Course Objectives:**

Develop ability to

1. To understand the fundamentals of Cryptography.
2. To learn about how to maintain the Confidentiality, Integrity and Availability of data.
3. To impart knowledge on network security issues, services, goals and mechanisms.
4. To analyze the security of communication systems, networks and protocols.
5. To apply algorithms used for secure transactions in real world applications.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Demonstrate the knowledge of cryptography and network security concepts and applications.
- CO 2: Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- CO 3: Ability to apply security principles in system design.
- CO 4: Ability to identify and investigate vulnerabilities and security threats and mechanisms to counter them.
- CO 5: Compare and Contrast different IEEE standards and electronic mail security

**UNIT-I: Security Attacks**

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

**UNIT-II: Conventional Encryption**

Principles, Conventional encryption algorithms (DES, AES, RC4, Blowfish), cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.

**UNIT-III: Number Theory:**

Modular Arithmetic, Euclid’s Algorithm, Fermat’s and Euler’s Theorem, Chinese Remainder Theorem, Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

**UNIT-IV: Email privacy**

Pretty Good Privacy (PGP) and S/MIME.

IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

**UNIT-V : Web Security**

Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

Intruders, Viruses and related threats, Firewall Design principles, Trusted Systems, Intrusion Detection Systems.

**TEXT BOOKS:**

1. “Cryptography and Network Security” by William Stallings 3rd Edition, Pearson Education.
2. “Applied Cryptography” by Bruce Schneier 2<sup>nd</sup> Edition, Wiley Publisher.

**REFERENCE BOOKS:**

1. Cryptography and Network Security by Behrouz A.Forouzan, 2<sup>nd</sup> edition, Tata McGraw-Hill Education.

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**18MCS105 – INTERNET OF THINGS**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s): None**

**Course Objectives:**

Develop ability to

1. To introduce the terminology, technology and its applications
2. To introduce the raspberry PI platform, that is widely used in IoT applications
3. To introduce the implementation of web based services on IoT devices
4. Understand State of the Art – IoT Architecture.
5. Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

**Course Outcomes (COs):**

At the end of the course, student would be able to

CO 1: Understand the new computing technologies

CO 2: Able to apply the latest computing technologies like cloud computing technology and Big Data

CO 3: Ability to introduce the concept of M2M (machine to machine) with necessary protocols

CO 4: Get the skill to program using python scripting language which is used in many IoT devices

CO 5: Illustrate the application of IoT in Industrial Automation and identify Real World Design Constraints.

**Unit I : Introduction to Internet of Things**

Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, Iot Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

**Unit II : IoT and M2M**

Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

**Unit III : Introduction to Python**

Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

**Unit IV : IoT Physical Devices and Endpoints**

Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

**Unit V : IoT Physical Servers and Cloud Offerings**

Introduction to Cloud Storage models and communication APIs Webservice – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

**Text Books:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

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**18MCS106 – SOFTWARE ARCHITECTURES**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s): None**

**Course Objectives:**

Develop ability to

1. To understand the concept of software architecture
2. To understand the design, documentation of software Architecture and Reconstruct.
3. To understand importance of Architecture Evaluation and Methods.
4. To understand reusability of Architecture
5. Be capable of applying his knowledge to create an architecture for given application.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Students can Design, document and Reconstruct Software Architecture
- CO 2: Students have profound knowledge on Software Architecture
- CO 3: Students can evaluate Architecture
- CO 4: Students can reuse the Architecture
- CO 5: Do a case study in utilizing architectural structures.

**UNIT I : Envisioning Architecture**

The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.

A-7E – A case study in utilizing architectural structures

**UNIT II : Creating an Architecture**

Understanding Quality Attributes, Achieving qualities, Architectural styles and patterns

Air Traffic Control – a case study in designing for high availability

**UNIT III : Designing the Architecture**

Documenting software architectures, Reconstructing Software Architecture

Flight Simulation – a case study in Architecture for Integrability

**UNIT IV : Analyzing Architectures**

Architecture Evaluation, Architecture design decision making, ATAM, CBAM.

The Nightingale System - a case study in Applying the ATAM

The NASA ECS Project – a case study in Applying the CBAM

**UNIT V : Moving from one system to many**

Software Product Lines, Building systems from off the shelf components, Software architecture in future.

Celsius Tech – a case study in product line development

**TEXT BOOKS:**

1. Software Architecture in Practice, , Len Bass, Pau Clements & Rick Kazman, second edition Pearson Education,2003.

**REFERENCE BOOKS:**

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003

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**18MCS107 – INFORMATION RETRIEVAL SYSTEMS**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s): Data Structures**

**Course Objectives:**

Develop ability to

1. To learn the important concepts and algorithms in IRS
2. To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.
3. Analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia.
4. Demonstrate the usage of different data/file structures in building computational search engines
5. Demonstrate Information visualization technologies like Cognition and perception in the Internet or Web search engine.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Ability to apply IR principles to locate relevant information large collections of data
- CO 2: Ability to design different document clustering algorithms
- CO 3: Implement retrieval systems for web search tasks.
- CO 4: Design an Information Retrieval System for web search tasks.
- CO 5: Understand the relationship between IR, hypermedia, and semantic models.

**UNIT I : Introduction**

Motivation, Basic Concepts, Past-Present and Future, the Retrieval Process Modeling: Introduction, A Taxonomy of Information retrieval Models, Retrieval: Ad hoc and Filtering, A Formal Characteristics of IR Models, Classic Information Retrieval, Alternative Set Theory Models, Alternative Probabilistic Models, Structured Text Retrieval Models, Model for Browsing

**UNIT II : Retrieval Evaluation**

Introduction, retrieval Performance Evaluation, Reference Collections

**Query languages**

Introduction, Keyword-Based Querying, Pattern Matching, Structural Queries, Query Protocols

**Query Operations**

Introduction, User Relevance Feedback, Automatic Local Analysis, Automatic global Analysis

**Text Operations**

Introduction, Document Preprocessing, Document Clustering, Text Compression, Comparing text Compression Techniques

**UNIT III : Indexing and Searching**

Introduction, Inverted Files, Other Indices for Text, Boolean queries, Sequential Searching, pattern Matching, Structural Queries, Compression

### **Searching the Web**

Introduction, Challenges, Characterizing the Web, Search Engines, Browsing, Metasearches, Finding the Needle in the Haystack, Searching using Hyperlinks

### **UNIT IV : User Interfaces and Visualization**

Introduction, human-Computer Interaction, The Information Access Process, Starting Points, Query Specification, Context, User Relevance Judgments, Interface Support for the Search Process

### **UNIT V : Multimedia IR**

#### **Models and Languages**

Introduction, Data Modeling, Query Languages

#### **Multimedia IR: Indexing and Searching**

Introduction, Background-Spatial Access Methods, A Generic Multimedia Indexing Approach, One Dimensional Time Series, Two dimensional Color Images, Automatic Feature Extraction.

### **TEXT BOOKS**

1. Modern Information Retrieval By Yates and Neto Pearson Education.

### **REFERENCE BOOKS**

1. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
2. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
3. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.

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**18MCS108 – DISTRIBUTED SYSTEMS**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s):** A course on “ Operating Systems”  
A course on “Network Security and Cryptography”

**Course Objectives:**

Develop ability to

1. This course provides an insight into Distributed systems.
2. Topics include- Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory
3. Topics include- Peer to Peer Systems, Transactions and Concurrency control, Security and Distributed shared memory
4. It provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission, IPC mechanisms in distributed systems, Remote procedure calls.
5. Expose students to current technology used to build architectures to enhance distributed computing infrastructures with various computing principles

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Ability to understand Transactions and Concurrency control.
- CO 2: Ability to understand Security issues.
- CO 3: Understanding Distributed shared memory.
- CO 4: Ability to design distributed systems for basic level applications.
- CO 5: Able to develop new distributed applications.

**UNIT I : Characterization of Distributed Systems**

Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models- Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication, Distributed objects and Remote Invocation- Introduction, Communication between distributed objects, RPC, Events and notifications, Case study- Java RMI.

**UNIT II : Operating System Support**

Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems- Introduction, File Service architecture, case study- SUN network file systems.

Name Services- Introduction, Name Services and the Domain Name System, Case study of the Global Name Service, Case study of the X.500 Directory Service.

**UNIT III : Peer to Peer Systems**

Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies- Pastry, Tapestry, Application case studies- Squirrel, OceanStore.

Time and Global States- Introduction, Clocks, events and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging.

Coordination and Agreement-Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus and related problems.

**UNIT IV : Transactions and Concurrency control**

Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery, Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

**UNIT V : Security**

Introduction, Overview of Security techniques, Cryptographic algorithms, Digital signatures, Case studies-Kerberos, TLS, 802.11 WiFi.

Distributed shared memory, Design and Implementation issues, Sequential consistency and Ivy case study, Release consistency and Munin case study, Other consistency models, CORBA case study-Introduction, CORBA RMI, CORBA Services.

**TEXT BOOKS:**

1. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
2. Distributed Systems, S.Ghosh, Chapman&Hall/CRC, Taylor&Francis Group, 2010.

**REFERENCE BOOKS:**

1. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.
2. Distributed Operating Systems Concepts and Design, Pradeep K.Sinha, PHI.
3. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, TMH.
4. Reliable Distributed Systems, K.P.Birman, Springer.
5. Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
6. Distributed Operating Systems and Algorithm Analysis, R.Chow, T.Johnson, Pearson.
7. Distributed Operating Systems, A.S.Tanenbaum, Pearson education.
8. Distributed Computing, Principles, Algorithms and Systems, Ajay D.Kshemakalyani and Mukesh Singhal, Cambridge, 2010.

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**18MCS1L1 – ADVANCED DATA STRUCTURES LAB**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
-	-	4	2

**Prerequisite(s):** A course on “Computer Programming & Data Structures”

**Course Objectives:**

Develop ability to

1. Introduces the basic concepts of Abstract Data Types.
2. Reviews basic data structures such as stacks and queues.
3. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs, and B-trees.
4. Introduces sorting
5. Introduces pattern matching algorithms

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Ability to select the data structures that efficiently model the information in a problem.  
 CO 2: Ability to assess efficiency trade-offs among different data structure implementations or combinations.  
 CO 3: Implement and know the application of algorithms for sorting  
 CO 4: Implement pattern matching Algorithms.  
 CO 5: Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and B-trees.

**List of Experiments**

1. Write a 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.
2. Write a program for implementing the following sorting methods:
  - a) Merge sort      b) Heap sort      c) Quick sort
3. Write a program to perform the following operations:
  - a) Insert an element into a B- tree.
  - b) Delete an element from a B- tree.
  - c) Search for a key element in a B- tree.
4. Write a program to perform the following operations:
  - a) Insert an element into a Min-Max heap
  - b) Delete an element from a Min-Max heap
  - c) Search for a key element in a Min-Max heap
5. Write a program to perform the following operations:
  - a) Insert an element into a Leftist tree
  - b) Delete an element from a Leftist tree
  - c) Search for a key element in a Leftist tree
6. Write a program to perform the following operations:
  - a) Insert an element into a binomial heap
  - b) Delete an element from a binomial heap.
  - c) Search for a key element in a binomial heap

7. Write a program to perform the following operations:
  - a) Insert an element into a AVL tree.
  - b) Delete an element from a AVL search tree.
  - c) Search for a key element in a AVL search tree.
8. Write a program to perform the following operations:
  - a) Insert an element into a Red-Black tree.
  - b) Delete an element from a Red-Black tree.
  - c) Search for a key element in a Red-Black tree.
9. Write a program to implement all the functions of a dictionary using hashing.
10. Write a program for implementing Knuth-Morris-Pratt pattern matching algorithm.
11. Write a program for implementing Brute Force pattern matching algorithm.
12. Write a program for implementing Boyer pattern matching algorithm.

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**18MCS1L2 – MACHINE LEARNING LAB**

M.Tech. CSE I Year, I Semester

L	T	P/D	C
-	-	4	2

**Prerequisite(s):** None

**Course Objectives:**

Develop ability to

1. Understand the Concept Learning algorithms.
2. Ability to Understand the Concept Learning algorithms.
3. Students should be able to design and implement machine learning solutions to classification, regression, and clustering problems.
4. The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.
5. Able to evaluate and interpret the results of the algorithms.

**Course Outcomes (COs):**

At the end of the course, student would be able to

CO 1: Understand complexity of Machine Learning algorithms and their limitations;

CO 2: Understand modern notions in data analysis oriented computing;

CO 3: Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;

CO 4; Be capable of performing experiments in Machine Learning using real-world data.

CO 5: Be capable of performing distributed computations

**List of Experiments**

1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)
2. Extract the data from database using python
3. Implement k-nearest neighbours classification using python
4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

medium skiing design single twenties no -> highRisk  
high golf trading married forties yes -> lowRisk  
low speedway transport married thirties yes -> medRisk  
medium football banking single thirties yes -> lowRisk  
high flying media married fifties yes -> highRisk  
low football security single twenties no -> medRisk  
medium golf media single thirties yes -> medRisk  
medium golf transport married forties yes -> lowRisk  
high skiing banking single thirties yes -> highRisk  
low golf unemployed married forties yes -> highRisk

Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `medRisk' in the dataset?

6. Implement linear regression using python.
7. Implement Naïve Bayes theorem to classify the English text
8. Implement an algorithm to demonstrate the significance of genetic algorithm
9. Implement the finite words classification system using Back-propagation algorithm

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**18MCS1L3 – CRYPTOGRAPHY & NETWORK SECURITY LAB**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
-	-	4	2

**Prerequisite(s):None**

**Course Objectives:**

Develop ability to

1. To understand basics of Cryptography and Network Security.
2. To be able to secure a message over insecure channel by various means.
3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4. To understand various protocols for network security to protect against the threat in the networks.
5. Students have to understand the tools in cryptography to develop the realtime applications.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Provide security of the data over the network.
- CO 2: Do research in the emerging areas of cryptography and network security.
- CO 3. Implement various networking protocols.
- CO 4. Protect any network from the threats in the world
- CO 5. Identify computer and network security threats, classify the threats and develop a security model to prevent, detect and recover from the attacks

**List of Experiments**

1. Write a client-server program where client sends a text message to server and server sends the text message to client by changing the case(uppercase and lowercase) of each character in the message.
2. Write a client-server program to implement following classical encryption techniques:
  - caesar cipher
  - transposition cipher
  - row substitution cipher
  - hill cipher
3. Install JCrypt tool (or any other equivalent) and demonstrate Asymmetric, Symmetric crypto algorithm, Hash and Digital/PKI signatures studied in theory Network Security and Management

Tools:

1. PERFORM AN EXPERIMENT TO DEMONSTRATE HOW TO SNIFF FOR ROUTER TRAFFIC BY USING THE TOOL WIRESHARK
2. USING NMAP
  - A. FIND OPEN PORTS ON A SYSTEM
  - B.FIND THE MACHINES WHICH ARE ACTIVE
  - C.FIND THE VERSION OF REMOTE OS ON OTHER SYSTEMS
  - D.FIND THE VERSION OF S/W INSTALLED ON OTHER SYSTEM

Ethical Hacking:

1. Setup a honey pot and monitor the honey pot on network
2. Write a script or code to demonstrate SQL injection attacks
3. Create a social networking website login page using phishing techniques
4. Write a code to demonstrate DoS attacks
5. INSTALL ROOTKITS AND STUDY VARIETY OF OPTIONS

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**18MCS1L4 –Internet of Things Lab**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
-	-	4	2

**Prerequisite(s):None**

**Course Objectives:**

Develop ability to

1. To introduce the raspberry PI platform, that is widely used in IoT applications
2. To introduce the implementation of distance sensor on IoT devices
3. Support multidisciplinary experiments.
4. Bring the researcher and the end-user together, with closer interactions between the experiments and the society
5. Pursuing, supporting and taking part in research and development activities

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Ability to introduce the concept of M2M (machine to machine) with necessary protocols and get awareness in implementation of distance sensor
- CO 2: Get the skill to program using python scripting language which is used in many IoT devices
- CO 3: Apply IOT to different applications.
- CO 4: Analysis and evaluate protocols used in IOT
- CO 5: Analysis and evaluate the data received through sensors in IOT.

**List of Experiments**

1. Using raspberry pi
  - a. Calculate the distance using distance sensor.
  - b. Basic LED functionality.
2. Using Arduino
  - a. Calculate the distance using distance sensor.
  - b. Basic LED functionality.
  - c. Calculate temperature using temperature sensor.
3. Using Node MCU
  - a. Calculate the distance using distance sensor.
  - b. Basic LED functionality.

Calculate temperature using temperature sensor.

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**18MCS109 – RESEARCH METHODOLOGIES and IPR**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
2	-	-	2

**Prerequisite(s): None**

**Course Objectives:**

Develop ability to

1. Introduce research paper writing and induce paper publication skills.
2. Introduce the concept of Analytics for Business
3. Introduce Hypothesis Testing
4. Introduce Presentation of the Research Work
5. Give the introduction to Intellectual Property Rights

**Course Outcomes (COs):**

At the end of the course, student would be able to

CO 1: Ability to distinguish research methods

CO 2: Ability to write and publish a technical research paper

CO 3: Ability to review papers effectively

CO 4: Assess different multiple analytical methodologies and Explore chosen algorithms for accuracy

CO 5: IPR and Patent filing

**Unit-I : Introduction**

Objective of Research; Definition and Motivation; Types of Research; Research Approaches; Steps in Research Process; Criteria of Good Research; Ethics in Research.

Research Formulation and Literature Review:

Problem Definition and Formulation; Literature Review; Characteristics of Good Research Question; Literature Review Process.

**Unit-II : Data Collection**

Primary and Secondary Data; Primary and Secondary Data Sources; Data Collection Methods; Data Processing; Classification of Data.

Data Analysis:

Statistical Analysis; Multivariate Analysis; Correlation Analysis; Regression Analysis; Principle Component Analysis; Samplings;

**Unit-III : Research Design**

Need for Research Design; Features of a Good Design; Types of Research Designs; Induction and Deduction.

**Hypothesis Formulation and Testing:**

Hypothesis; Important Terms; Types of Research Hypothesis; Hypothesis Testing; Z-Test; t-Test; f-Test; Making a Decision; Types of Errors; ROC Graphics.

**Unit-IV : Test Procedures**

Parametric and Non Parametric Tests; ANOVA; Mann-Whitney Test; Kruskal-Wallis Test; Chi-Square Test; Multi-Variate Analysis

**Presentation of the Research Work:**

Business Report; Technical Report; Research Report; General Tips for Writing Report; Presentation of Data; Oral Presentation; Bibliography and References; Intellectual Property Rights; Open-Access Initiatives; Plagiarism.

**UNIT-V: Law of Patents, Patent Searches, Ownership, Transfer**

Patentability – Design Patents – Double Patenting – Patent Searching – Patent Application Process – Prosecuting the Application, Post-issuance Actions, Term and Maintenance of Patents. Ownership Rights – Sole and Joint Inventors – Inventions Made by Employees and Independent Contractors – Assignment of Patent Rights – Licensing of Patent Rights – Invention Developers and Promoters.

**Patent Infringement, New Developments and International Patent Law**

Direct Infringement – Inducement to Infringe – Contributory Infringement – First Sale Doctrine – Claims Interpretation – Defenses to Infringement – Remedies for Infringement – Resolving an Infringement Dispute – Patent Infringement Litigation. New Developments in Patent Law

**TEXT BOOKS :**

1. Research Methodology. Methods & Technique : Kothari. C.R.
2. Intellectual Property – Copyrights, Trademarks, and Patents by Richard Stim, Cengage Learning

**REFERENCE BOOKS :**

1. Practical Research : planning and Design( 8th Edition) – Paul D. Leedy and Jeanne E. Ormrod.
2. A Hand Book of Education Research – NCTE
3. Methodology of Education Research – K.S. Sidhu.
4. Tests, Measurements and Research methods in Behavioural Sciences- A.K. Singh.
5. Statistical Methods- Y.P. Agarwal.
6. Methods of Statistical Ananalysis- P.S Grewal.
7. Fundamentals of Statistics – S.C. Gupta, V.K. Kapoor.
8. Intellectual Property Rights by Deborah E. Bouchoux, Cengage Learning.
9. Managing Intellectual Property – The Strategic Imperative, Second Edition by
10. Vinod V.Sople, PHI Learning Private Limited.
11. Research methodology – S.S. Vinod Chandra, S. Anand Hareendran

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**18MAC101 – INDIAN CONSTITUTION  
(AUDITCOURSE-1)**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
2	-	-	-

**Prerequisite(s): None**

**Course Objectives:**

Develop ability to

1. Understand the need for a constitution
2. Appreciate the fundamental duties and rights of the citizens of India
3. Explain the role of constitution in a democratic society
4. Describe the Directive Principles of State Policy and their significance
5. List the key features of the constitution, Union Government, and State Governments.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO1: Create awareness about the constitutional values and objectives written in the Indian Constitution.
- CO2: List the fundamental rights and fundamental duties of Indian citizens.
- CO3: Identify the division of legislative, executive and financial powers between the union and the state governments.
- CO4: Understand the working of Indian democracy, its institutions and processes at the local, state and union levels.
- CO5: Explain the functions and responsibilities of Election commission of India and Union Public Service Commission.

**Unit I: Introduction to Indian Constitution**

Meaning of the term Constitution, Preamble of the Constitution, Constituent Assembly, The Salient Features of Indian Constitution

**Unit II: Fundamental Rights of citizen**

Fundamental Rights of citizen, Fundamental Duties of citizen, The Directive Principles of State Policy

**Unit III: Union Government**

Union Government , Union Legislature (Parliament) , Lok Sabha and Rajya Sabha (with Powers and Functions) , Union Executive , President of India (with Powers and Functions) , Prime Minister of India (with Powers and Functions) , Union Judiciary (Supreme Court) , Jurisdiction of the Supreme Court.

**Unit IV: State Government**

State Government , State Legislature (Legislative Assembly / Vidhan Sabha, Legislative Council / Vidhan Parishad) , Powers and Functions of the State Legislature , State Executive, Governor of the State (with Powers and Functions) , The Chief Minister of the State (with Powers and Functions) State Judiciary (High Courts)

**Unit V: Local Self Government**

Election Commission of India (with Powers and Functions), The Union Public Service Commission (with Powers and Functions)

**TEXT BOOKS:**

1. P.M. Bakshi, The Constitution of India, Universal Law Publishing co.,
2. Dr Durga Das Basu, Introduction to the Constitution of India, LexisNexis Publishers
3. NCERT, Indian Constitution at work

**REFERENCE BOOKS:**

1. M. Laxmikanth, Constitution of India, Cengage Publications.
2. Granville Austin, The Indian Constitution, Oxford India Paperback Edition.

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**18MAC102 – SOFT SKILLS  
(AUDITCOURSE-1)**

**M.Tech. CSE I Year, I Semester**

L	T	P/D	C
2	-	-	-

**Prerequisite(s): None**

**Course Objectives:**

Develop ability to

1. To improve the fluency of students in English
2. To facilitate learning through interaction
3. To illustrate the role of skills in real-life situations with case studies, role plays etc.
4. To train students in group dynamics, body language and various other activities which boost their confidence levels and help in their overall personality development
5. To encourage students develop behavioral skills and personal management skills
6. To impart training for empowerment, thereby preparing students to become successful professionals

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO1. Developed critical acumen and creative ability besides making them industry- ready.
- CO2. Appropriate use of English language while clearly articulating ideas.
- CO3. Developing insights into Language and enrich the professional competence of the students.
- CO4. Enable students to meet challenges in job and career advancement.

**INTRODUCTION**

Definition and Introduction to Soft Skills – Hard Skills vs Soft Skills – Significance of Soft/Life/Self Skills – Self and SWOT Analysis *and*

**1. Exercises on Productivity Development**

Effective/ Assertive Communication Skills (Activity based)

Time Management (Case Study)

Creativity & Critical Thinking (Case Study)

Decision Making and Problem Solving (Case Study)

Stress Management (Case Study)

**2. Exercises on Personality Development Skills**

Self-esteem (Case Study)

Positive Thinking (Case Study)

Emotional Intelligence (Case Study)

Team building and Leadership Skills (Case Study)

Conflict Management (Case Study)

### **3. Exercises on Presentation Skills**

Netiquette

Importance of Oral Presentation – Defining Purpose- Analyzing the audience-Planning Outline and Preparing the Presentation- Individual & Group Presentation- Graphical Organizers- Tools and Multi-media Visuals

One Minute Presentations (Warming up)

PPT on Project Work- Understanding the Nuances of Delivery- Body Language – Closing and Handling Questions – Rubrics for Individual Evaluation (Practice Sessions)

### **4. Exercises on Professional Etiquette and Communication**

Role-Play and Simulation- Introducing oneself and others, Greetings, Apologies, Requests, Agreement & Disagreement....etc.

Telephone Etiquette

Active Listening

Group Discussions (Case study) - Group Discussion as a part of Selection Procedure - Checklist of GDs

Analysis of Selected Interviews (Objectives of Interview)

Mock-Interviews (Practice Sessions)

Job Application and Preparing Resume

Process Writing (Technical Vocabulary) – Writing a Project Report-Assignments

### **5. Exercises on Ethics and Values**

Introduction — Types of Values - Personal, Social and Cultural Values - Importance of Values in Various Contexts

Significance of Modern and Professional Etiquette – Etiquette (Formal and Informal Situations with Examples)

Attitude, Good Manners and Work Culture (Live Examples)

Social Skills - Dealing with the Challenged (Live Examples)

Professional Responsibility – Adaptability (Live Examples)

Corporate Expectations

Note: Hand-outs are to be prepared and given to students.

Training plan will be integrated in the syllabus.

Topics mentioned in the syllabus are activity-based.

### **SUGGESTED READING:**

1. Alex, K. 2012. Soft Skills. S. Chand Publishers
2. Management Shapers. 2011. Collection of 28 Books by different Authors. Universities Press.
3. Sherfield, Robert M. 2005. et al Cornerstone: Developing Soft Skills. Pearson
4. Suresh Kumar,E; Sreehari, P. & Savithri, J. 2011. Communication Skills and Soft Skills-
5. An Integrated Approach. New Delhi: Pearson
6. The ACE of Soft Skills by Gopaldaswamy Ramesh & Mahadevan Ramesh. 2013. Pearson Publishers. New Delhi.
7. Patnaik, P. 2011. Group Discussion and Interview Skills. New Delhi: Foundation
8. Sudhir Andrews. 2009. How to Succeed at Interviews. New Delhi: Tata McGraw Hill
9. Sasikumar, V & Dhamija, P.V. 1993. Spoken English - A Self-Learning Guide to Conversation Practice. New Delhi: Tata McGraw-Hill
10. Dixso, Richard J. Everyday Dialogues in English. Prentice Hall India Pvt Ltd
11. Mukhopadhyay. L et al. 2012. Polyskills. New Delhi: CUP India Pvt Ltd
12. Rizvi, M. A. 2005. Effective Technical Communication. New Delhi: Tata McGraw Hill
13. The Hindu Speaks on Education by the Hindu Newspaper
14. Naterop, B. Jean and Revell, Rod. 2004. Telephoning in English. Cambridge: CUP

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**18MCS201 – ADVANCED ALGORITHMS**

**M.Tech. CSE I Year, II Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s): None**

**Course Objectives:**

Develop ability to

1. Introduces the recurrence relations for analyzing the algorithms.
2. Introduces the graphs and their traversals.
3. Describes major algorithmic techniques (divide-and-conquer, greedy, dynamic programming, Brute Force , Transform and Conquer approaches) and mention problems for which each technique is appropriate.
4. Describes how to evaluate and compare different algorithms using worst-case, average-case and best-case analysis.
5. Introduces string matching algorithms.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO1. Analyze the performance of algorithms.
- CO2. Choose appropriate data structures and algorithm design methods for a specified application.
- CO3. Describe how the choice of data structures and the algorithm design methods impact the performance of programs.
- CO4. Explain linear programming string matching algorithms.
- CO5. Analyze the algorithms techniques and mathematical analysis of recursive algorithms.

**Unit- I : Classification of algorithms**

Algorithm Specifications, Mathematical analysis of Recursive Algorithms: – Introduction to recurrence equations, formulation of recurrence equations, Techniques for solving recurrence equations, Solving recurrence equations, Solving Recurrence Equations using polynomial reduction, Divide and conquer recurrences

**Unit- II : Graphs**

Graphs :- Graph representations, Graph traversals

Brute Force Approaches:- Computational Geometry Problems-Closest pair problem, Convex Hull Problem, Exhaustive Searching- Magic Squares problem, Container Loading problem, Knapsack Problem, Assignment Problem

**Unit-III : Divide and Conquer approach**

Multiplication of long integers, Strassen's matrix multiplication, Fourier Transform

Greedy algorithms:- Coin change problem, Scheduling problems, knapsack problem, optimal storage on tapes, optimal tree problems, optimal graph problems

**Unit- IV : Transform and Conquer approach**

Matrix operations- Gaussian Elimination method, LU decomposition, Crout's method of decomposition

Dynamic Programming:- Computing binomial coefficients, Multistage graph problem, Transitive Closure and Warshall algorithm, Floyd warshall all pairs shortest path problem, TSP, Flow shop scheduling algorithm

**Unit-V : String algorithms**

Basic string algorithms, Longest Common Subsequences, Naive String Matching algorithm, Rabin Karp, KMP, Harspool algorithm

Linear Programming, Graphical method for solving LPP, Simplex method, Minimization problems, Principle of Duality, Max Flow problem

**TEXT BOOKS:**

1. Design and Analysis of Algorithms, S.Sridhar, OXFORD University Press

**REFERENCE BOOKS:**

1. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt. Ltd./ Pearson Education.
2. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Universities Press.
3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft, Pearson education

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**18MCS202 – SOFT COMPUTING**

**M.Tech. CSE I Year, II Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s): None**

**Course Objectives:**

Develop ability to

1. Artificial Intelligence, Various types of production systems, characteristics of production systems.
2. This course explain AI problems and search techniques.
3. To understand the supervised and unsupervised learning networks
4. Introduces classical sets and fuzzy sets.
5. To understand genetic algorithms.

**Course Outcomes (COs):**

At the end of the course, student would be able to

CO 1: Learn about soft computing techniques and their applications

CO 2. Comprehend the differences between classical sets and fuzzy sets

CO 3. Able to provide solutions to general pattern reorganization problem.

CO 4. Get the skill for application of search techniques to solve AI problems

CO 5. Able to design a genetic algorithms based solution for solving real time problems

**UNIT-I : AI Problems and Search**

AI problems, Techniques, Problem Spaces and Search, Heuristic Search Techniques- Generate and Test, Hill Climbing, Best First Search Problem reduction, Constraint Satisfaction and Means End Analysis. Approaches to Knowledge Representation- Using Predicate Logic and Rules.

**UNIT-II : Artificial Neural Networks**

Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Backpropagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

**UNIT-III : Unsupervised Learning Network**

Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

**UNIT-IV : Classical Sets and Fuzzy Sets**

Introduction to Classical Sets ( crisp Sets) and Fuzzy Sets- operations and Fuzzy sets. Classical Relations -and Fuzzy Relations- Cardinality, Operations, Properties and composition. Tolerance and equivalence relations.

Membership functions- Features, Fuzzification, membership value assignments, Defuzzification.

**UNIT-V : Fuzzy Arithmetic and Fuzzy Measures**

Fuzzy Rule Base and Approximate Reasoning Fuzzy Decision making Fuzzy Logic Control Systems. Genetic Algorithm- Introduction and basic operators and terminology. Applications: Optimization of TSP, Internet Search Technique

**TEXT BOOKS**

1. Principles of Soft Computing- S N Sivanandam, S N Deepa, Wiley India, 2007
2. Soft Computing and Intelligent System Design -Fakhreddine O Karray, Clarence D Silva, Pearson Edition, 2004.

**REFERENCE BOOKS**

1. Artificial Intelligence and Soft Computing- Behavioural and Cognitive Modelling of the Human
2. Brain- Amit Konar, CRC press, Taylor and Francis Group.
3. Artificial Intelligence – Elaine Rich and Kevin Knight, TMH, 1991, rp2008.
4. Artificial Intelligence – Patric Henry Winston – Third Edition, Pearson Education.
5. A first course in Fuzzy Logic-Hung T Nguyen and Elbert A Walker, CRC. Press Taylor and Francis Group.

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**18MCS203 – DIGITAL FORENSICS**

**M.Tech. CSE I Year, II Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s): None**

**Course Objectives:**

Develop ability to

1. To provide an understanding Computer forensics fundamentals
2. To analyze various computer forensics technologies
3. To provide computer forensics systems
4. To identify methods for data recovery.
5. To apply the methods for preservation of digital evidence

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Understand the definition of computer forensics fundamentals.
- CO 2: Describe the types of computer forensics technology.
- CO 3: Analyze various computer forensics systems.
- CO 4: Illustrate the methods for data recovery, evidence collection and data seizure.
- CO 5: Summarize duplication and preservation of digital evidence.

**UNIT – I : Computer Forensics Fundamentals**

What is Computer Forensics?, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement — Computer Forensic Technology — Types of Business Computer Forensic Technology Computer Forensics Evidence and Capture: Data Recovery Defined — Data Back-up and Recovery — The Role of Back-up in Data Recovery — The Data-Recovery Solution.

**UNIT-II : Evidence Collection and Data Seizure**

Why Collect Evidence? Collection Options — Obstacles — Types of Evidence — The Rules of Evidence — Volatile Evidence — General Procedure — Collection and Archiving — Methods of Collection — Artifacts — Collection Steps — Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene — Computer Evidence Processing Steps — Legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image Verification and Authentication: Special Needs of Evidential Authentication — Practical Consideration — Practical Implementation.

**UNIT – III : Computer Forensics analysis and validation**

Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

**Network Forensics:** Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

**Processing Crime and Incident Scenes:** Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search,

securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case

**UNIT – IV : Current Computer Forensic tools**

Evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

**Cell phone and mobile device forensics:** Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

**UNIT – V : Working with Windows and DOS Systems**

understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

**TEXT BOOKS :**

1. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning

**REFERENCE BOOKS :**

1. Real Digital Forensics by Keith J. Jones, Richard Bejtlich, Curtis W. Rose, Addison-Wesley Pearson Education
2. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer International edition.
3. Computer Evidence Collection & Presentation by Christopher L.T. Brown, Firewall Media.
4. Homeland Security, Techniques & Technologies by Jesus Mena, Firewall Media.
5. Software Forensics Collecting Evidence from the Scene of a Digital Crime by Robert M. Slade, TMH 2005
6. Windows Forensics by Chad Steel, Wiley India Edition.

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**18MCS204 – DATA ANALYTICS**

**M.Tech. CSE I Year, II Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s): None**

**Course Objectives:**

Develop ability to

1. To explore the fundamental concepts of data analytics.
2. To learn the principles and methods of statistical analysis
3. Apply analytics on Structured, Unstructured Data.
4. Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
5. To understand the various search methods and visualization techniques.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Understand the impact of data analytics for business decisions and strategy
- CO 2: Carry out data analysis/statistical analysis
- CO 3: To carry out standard data visualization and formal inference procedures
- CO 4: Design Data Architecture
- CO 5: Understand various Data Sources

**UNIT – I : Data Management**

Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

**UNIT – II : Data Analytics**

Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

**UNIT – III : Regression**

Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

**UNIT – IV : Object Segmentation**

Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

**UNIT – V : Data Visualization**

Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

**TEXT BOOKS:**

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3<sup>rd</sup> Edition, Morgan Kaufmann Publishers.

**REFERENCE BOOKS:**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand RajaramanMilliway Labs Jeffrey D Ullman Stanford Univ.

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**18MCS205 – PARALLEL COMPUTING**

**M.Tech. CSE I Year, II Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s):** 1. Computer Organization & Architecture  
2. Operating Systems  
3. Programming for Problem solving

**Course Objectives:**

Develop ability to

1. To introduce the foundations of parallel Computing
2. To learn various parallel computing architectures and programming models
3. To gain knowledge of writing efficient parallel programs
4. Become familiar with contemporary parallel programming paradigms and the systems on which they are used.
5. Be able to design, develop, implement, test and instrument massively parallel programs, and apply those skills to a real-world application.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Ability to understand the concepts of parallel architectures
- CO 2: To understand the effects that issues of synchronization, latency and bandwidth have on the efficiency and effectiveness of parallel computing applications.
- CO 3: Ability to select the data structures that efficiently model the information in a problem.
- CO 4: Ability to develop an efficient parallel algorithm to solve it.
- CO 5: Ability to implement an efficient and correct code to solve it, analyse its performance

**Unit I : Parallel Computing**

Introduction, Motivation and scope - Parallel Programming Platforms – Basic Communication Operations

**Unit II : Principles of Parallel Algorithm Design**

Analytical Modelling of Parallel Programs

**Unit III : Programming using Message Passing Paradigm(MPI)**

Programming Shared Address Space Platforms(PThreads)

**Unit IV : Dense Matric Algorithms**

Dense Matric Algorithms ( Matrix-Vector Multiplication , Matrix-Matrix Multiplication) –  
Sorting Algorithms ( Issues, Bubble Sort, Quick Sort, Bucket Sort, Enumeration Sort, Radix Sort)

**Unit V : Graph Algorithms**

Graph Algorithms ( Minimum Spanning Tree: Prim's Algorithm - Single-Source Shortest Paths: Dijkstra's Algorithm ) Search Algorithms ( DFS, BFS)

**TEXT BOOKS**

1. Introduction to Parallel Computing, Second Edition, Ananth Grama, George Karypis, Vipin Kumar, Anshul Gupta, Addison-Wesley, 2003, ISBN: 0201648652

**REFERENCE BOOKS**

1. Parallel Computing – Theory and Practice, Second Edition, Michael J. Quinn, Tata McGraw-Hill Edition.
2. Parallel Computers – Architectures and Programming, V. Rajaraman, C. Siva Ram Murthy, PHI.

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**18MCS206 – HUMAN COMPUTER INTERACTION**

**M.Tech. CSE I Year, II Semester**

**Prerequisite(s): None**

L	T	P/D	C
3	-	-	3

**Course Objectives:**

Develop ability to

1. To understand the design principles of developing a Human Computer Interface.
2. To learn tools and devices required for designing a good interface
3. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Value based living in a natural way.
4. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.
5. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

**Course Outcomes (COs):**

At the end of the course, student would be able to

CO 1: Acquire knowledge on principles and components of HCI.

CO 2: Analyze product usability evaluations and testing methods

CO 3: Design an effective user interface for software application using the building tools and techniques

CO 4: Ability to develop appropriate technologies and management patterns to create harmony in professional and personal life.

CO 5: It ensures students sustained happiness through identifying the essentials of human values and skills.

**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, direct manipulation, graphical system, Characteristics, Web user –interface popularity, characteristics- Principles of user interface.

**UNIT II : Design process**

Human interaction with computers, important of human characteristics in design, human considerations in design, Human interaction speeds, understanding business junctions.

**UNIT III : Screen Designing**

Interface design goals, Screen meaning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, Visually pleasing composition, amount of information, focus and emphasis, presenting information simply and meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design.

**UNIT IV : Windows**

Window characteristics, components of a window, presentation styles, types, management, organizing window functions, operations

Selection of device based and screen based controls.

**UNIT V: Interaction Devices**

Write clear text and messages, create meaningful Graphics, Icons, Images, Choose proper colors  
Keyboard and function keys, pointing devices, speech recognition digitization and generation, image and video displays, drivers.

**TEXT BOOKS:**

1. Wilbent. O. Galitz ,“The Essential Guide To User Interface Design”, Second Edition, Wiley India Edition
2. Ben Sheiderman, “Designing The User Interface”, Third Edition, Addison-Wesley

**REFERENCE BOOKS:**

1. Alan Cooper, “The Essential Of User Interface Design”, Wiley – Dream Tech Ltd., 2002.

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**18MCS207 – COMPUTER VISION**

**M.Tech. CSE I Year, II Semester**

**Prerequisite(s): None**

L	T	P/D	C
3	-	-	3

**Course Objectives:**

Develop ability to

1. To review image processing techniques for computer vision
2. To understand shape and region analysis
3. To understand Hough Transform and its applications to detect lines, circles, ellipses
4. To understand three-dimensional image analysis techniques
5. To understand motion analysis and some applications of computer vision algorithms

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO1. Implement fundamental image processing techniques required for computer vision
- CO2. Perform shape analysis and implement boundary tracking techniques
- CO3. Apply chain codes and other region descriptors
- CO4. Apply Hough Transform for line, circle, and ellipse detections
- CO5. Apply 3D vision techniques and implement motion related techniques to develop applications using computer vision techniques

**UNIT I : IMAGE PROCESSING FOUNDATIONS**

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

**UNIT II : SHAPES AND REGIONS**

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments

**UNIT III : HOUGH TRANSFORM**

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform – spatial matched filtering – GHT for ellipse detection – object location– GHT for feature collation

**UNIT IV : 3D VISION AND MOTION**

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based

representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – splinebased motion – optical flow – layered motion

#### **UNIT V : APPLICATIONS**

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians

#### **TEXTBOOK:**

1. E. R. Davies, “Computer & Machine Vision”, Fourth Edition, Academic Press, 2012.

#### **REFERENCE BOOKS:**

1. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer 2011.
2. Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference”, Cambridge University Press, 2012.
3. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Third Edition, Academic Press, 2012.
4. D. L. Baggio et al., “Mastering OpenCV with Practical Computer Vision Projects”, Packt Publishing, 2012.
5. Jan Erik Solem, “Programming Computer Vision with Python: Tools and algorithms for analyzing images”, O'Reilly Media, 2012.

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**18MCS208 – DISTRIBUTED DATABASES**

**M.Tech. CSE I Year, II Semester**

L	T	P/D	C
3	-	-	3

**Prerequisite(s):** A course on “Database Management Systems”

**Course Objectives:**

Develop ability to

1. To study the usage and applications of Object Oriented databases.
2. To learn the modeling and design of databases
3. To acquire knowledge on parallel and distributed databases and its applications.
4. Equip students with principles and knowledge of parallel and object oriented databases.
5. Topics include distributed DBMS architecture and design; query processing and optimization; distributed transaction management and reliability; parallel and object database management systems.

**Course Outcomes (COs):**

At the end of the course, student would be able to

CO 1: Understand theoretical and practical aspects of distributed database systems.

CO 2: Study and identify various issues related to the development of distributed database system.

CO 3: Understand the design aspects of object oriented database system and related development.

CO 4: Ability to write global queries for distributed databases.

CO 5: Create queries to retrieve data from a distributed database which will have optimum performance.

**UNIT I**

Features of Distributed versus Centralized Databases, Principles of Distributed Databases, Levels Of Distribution Transparency, Reference Architecture for Distributed Databases, Types of Data Fragmentation, Integrity Constraints in Distributed Databases, Distributed Database Design

**UNIT II**

Translation of Global Queries to Fragment Queries, Equivalence transformations for Queries, Transforming Global Queries into Fragment Queries, Distributed Grouping and Aggregate Function Evaluation, Parametric Queries.

Optimization of Access Strategies, A Framework for Query Optimization, Join Queries, General Queries

**UNIT III**

The Management of Distributed Transactions, A Framework for Transaction Management, Supporting Atomicity of Distributed Transactions, Concurrency Control for Distributed Transactions, Architectural Aspects of Distributed Transactions

Concurrency Control, Foundation of Distributed Concurrency Control, Distributed Deadlocks, Concurrency Control based on Timestamps, Optimistic Methods for Distributed Concurrency Control.

**UNIT IV**

Reliability, Basic Concepts, Nonblocking Commitment Protocols, Reliability and concurrency Control, Determining a Consistent View of the Network, Detection and Resolution of Inconsistency, Checkpoints and Cold Restart, Distributed Database Administration, Catalog Management in Distributed Databases, Authorization and Protection

**UNIT V**

Architectural Issues, Alternative Client/Server Architectures, Cache Consistency, Object Management, Object Identifier Management, Pointer Swizzling, Object Migration, Distributed Object Storage, Object Query Processing, Object Query Processor Architectures, Query Processing Issues, Query Execution, Transaction Management, Transaction Management in Object DBMSs, Transactions as Objects

Database Integration, Scheme Translation, Scheme Integration, Query Processing Query Processing Layers in Distributed Multi-DBMSs, Query Optimization Issues Transaction Management Transaction and Computation Model, Multidatabase Concurrency Control, Multidatabase Recovery, Object Orientation and Interoperability, Object Management Architecture CORBA and Database interoperability, Distributed Component Object Model, COM/OLE and Database Interoperability, PUSH-Based Technologies

**TEXT BOOKS:**

1. Distributed Databases Principles & Systems, Stefano Ceri, Giuseppe Pelagatti, TMH.
2. Principles of Distributed Database Systems, M. Tamer Ozsu, Patrick Valduriez , Pearson Education, 2nd Edition.

**REFERENCE BOOKS:**

1. Distributed Database Systems, Chanda Ray, Pearson.
2. Distributed Database Management Systems, S.K. Rahimi and Frank.S. Haug, Wiley.

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**18MCS2L1 – ADVANCED ALGORITHMS LAB**

**M.Tech. CSE I Year, II Semester**

**Prerequisite(s): None**

L	T	P/D	C
-	-	4	2

**Course Objectives:**

Develop ability to

1. Introduces the implementation of KMP algorithm and Horspool algorithm.
2. Describes the various assignment problems using Brute Force method.
3. Multiplication of long integers using divide and conquer method and solution for knapsack problem using Greedy method.
4. Implement solution for knapsack problem using Greedy method.
5. Implement Gaussian elimination method.

**Course Outcomes (COs):**

At the end of the course, student would be able to

CO 1: Ability to analyze the performance of algorithms using various methods.

CO 2: Ability to analyze the algorithms techniques and mathematical analysis of recursive algorithms.

CO 3: Ability to design algorithm for a specified application.

CO 4: Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs.

CO 5: Ability to understand linear programming and string matching algorithms.

**List of Experiments**

1. Implement assignment problem using Brute Force method
2. Perform multiplication of long integers using divide and conquer method.
3. Implement solution for knapsack problem using Greedy method.
4. Implement Gaussian elimination method.
5. Implement LU decomposition
6. Implement Warshall algorithm
7. Implement Rabin Karp algorithm.
8. Implement KMP algorithm.
9. Implement Horspool algorithm
10. Implement max-flow problem.

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18MCS2L2 – DIGITAL FORENSICS LAB**

**M.Tech. CSE I Year, II Semester**

L	T	P/D	C
-	-	4	2

**Prerequisite(s): None**

**Course Objectives:**

Develop ability to

1. To provide students with a comprehensive overview of collecting, investigating, preserving, and presenting evidence of cyber crime left in digital storage devices, emails, browsers, mobile devices using different Forensics tools
2. To Understand file system basics and where hidden files may lie on the disk, as well as how to extract the data and preserve it for analysis.
3. Understand some of the tools of e-discovery.
4. To understand the network analysis ,Registry analysis and analyse attacks using different forensics tools

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Learn the importance of a systematic procedure for investigation of data found on digital storage media that might provide evidence of wrong-doing
- CO 2: To Learn the file system storage mechanisms and retrieve files in hidden format
- CO 3: Learn the use of computer forensics tools used in data analysis.
- CO 4: Learn how to find data that may be clear or hidden on a computer disk, find our the open ports for the attackers through network analysis, Registry analysis.

**List of Experiments**

1. **Perform email analysis** using the tools like Exchange EDB viewer , MBOX viewer and View user mailboxes and public folders , Filter the mailbox data based on various criteria, Search for particular items in user mailboxes and public folders
2. **Perform Browser history analysis** and get the downloaded content , history ,saved logins,s earches ,websites visited etc using Foxton Forensics tool,Dumpzilla .
3. **Perform mobile analysis** in the form of retrieving call logs ,SMS log ,all contacts list using the forensics tool like SAFT
4. **Perfrom Registry analysis** and get boottime logging using process monitor tool
5. **Perform Disk imaging and cloning the** using the X-way Forensics tools
6. **Perform Data Analysis i.e** History about open file and folder, and view folder actions using Lastview activity tool
7. **Perform Network analysis** using the Network Miner tool .
8. **Perform information for incident response** using the crowd Response tool
9. **Perform File type detection using** Autospay tool
10. **Perform Memory capture and analysis** using the Live RAM capture or any forensic tool

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**18MCS2L3 – DATA ANALYTICS LAB**

**M.Tech. CSE I Year, II Semester**

**Prerequisite(s): None**

L	T	P/D	C
-	-	4	2

**Course Objectives:**

Develop ability to

1. To provide an overview of a new language R used for data Analytics.
2. To present the basic techniques for extracting information from large datasets
3. To familiarize students with how various statistics like mean median etc. can be collected for data exploration.
4. Predict outcomes with supervised learning techniques and Unearth the patterns with unsupervised techniques
5. Understand visualization tools.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Understand different files formats like .csv and .txt and learn how access these files.
- CO 2: Work on Data preprocessing methods
- CO 3: Understand various Data Sources
- CO 4: Carry out statistical analysis
- CO 5: Understand various techniques to visualize results of data.

**List of Experiments**

1. Demonstrate data cleaning – missing values
2. Implement data normalization (min-max, z-score)
3. Implement attribute subset selection for data reduction
4. Demonstrate outlier detection
5. Perform analytics on any standard data set
6. Implement linear regression
7. Implement logistic regression
8. Construct decision tree for weather data set
9. Analyze time-series data
10. Work on any data visualization tool

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18MCS2L4 – PARALLEL COMPUTING LAB**

**M.Tech. CSE I Year, II Semester**

L	T	P/D	C
-	-	4	2

**Prerequisite(s):**

1. Computer Organization & Architecture
2. Operating Systems
3. Programming for problem solving

**Course Objectives:**

Develop ability to

1. To introduce the foundations of parallel Computing
2. To learn various parallel computing architectures and programming models
3. To gain knowledge of writing efficient parallel programs
4. To gain knowledge on sorting algorithms.
5. Students will demonstrate an understanding of concepts, algorithms, and design principles underlying parallel computing, develop algorithm design and implementation skills, and gain practical experience in programming large scale parallel machines.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Ability to understand the concepts of parallel architectures  
 CO 2: Ability to select the data structures that efficiently model the information in a problem.  
 CO 3: Ability to develop an efficient parallel algorithm to solve it.  
 CO 4: Ability to implement an efficient and correct code to solve it, analyze its performance  
 CO 5: Design and write a parallel program to solve specific problems.

**List of Experiments**

1. Design a parallel program to implement Matrix-Vector and Matrix-Matrix Multiplication using MPI library.
2. Design a parallel program to implement Bubble Sort using OpenMP and Pthread Programming Constructs.
3. Design a parallel program to implement Quick Sort using OpenMP and Pthread Programming Constructs.
4. Design a parallel program to implement Bucket Sort using OpenMP and Pthread Programming Constructs.
5. Design a parallel program to implement Prim's Algorithm using OpenMP and Pthread Programming Constructs.
6. Design a parallel program to implement DFS Algorithm using OpenMP and Pthread Programming Constructs.
7. Design a parallel program to implement BFS Algorithm using OpenMP and Pthread Programming Constructs.
8. Design a parallel program to implement Dijkstra's Algorithm using MPI library.

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**18MAC201 – PROFESSIONAL ETHICS  
(AUDITCOURSE-1)**

**M.Tech. CSE I Year, II Semester**

L	T	P/D	C
2	-	-	-

**Prerequisite(s): None**

**Course Objectives:**

Develop ability to

1. Imbibe and internalize the Values and Ethical Behavior
2. Understand the basic theories of Ethics
3. Practice as a professional engineer.
4. Identify work place ethics.
5. Understand international ethical practices.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO1. Understand the importance of Values and Ethics in their personal lives
- CO2. Understand ethics in professional careers.
- CO3. Learn the rights and responsibilities as an employee.
- CO4. Understand work ethics
- CO5. Understand Global ethics

**UNIT - I : Introduction to Professional Ethics**

Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

**UNIT – II : Basic Theories**

Basic Ethical Principles, Moral Developments, Deontology, Utilitarianism, Virtue Theory, Rights Theory, Casuist Theory, Moral Absolution, Moral Rationalism, Moral Pluralism, Ethical Egoism, Feminist Consequentialism, Moral Issues, Moral Dilemmas, Moral Autonomy.

**UNIT - III : Professional Practices in Engineering**

Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers - The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

**UNIT - IV : Work Place Rights & Responsibilities**

Ethics in changing domains of Research, Engineers and Managers; Organizational Complaint Procedure, difference of Professional Judgment within the Nuclear Regulatory Commission (NRC), the Hanford Nuclear Reservation. Ethics in changing domains of research - The US government wide definition of research misconduct, research misconduct distinguished from

mistakes and errors, recent history of attention to research misconduct, the emerging emphasis on understanding and fostering responsible conduct, responsible authorship, reviewing & editing.

**UNIT - V : Global issues in Professional Ethics**

Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Deflection, Pollution, Ethics in Manufacturing and Marketing, Media Ethics; War Ethics; Bio Ethics, Intellectual Property Rights.

**TEXT BOOKS:**

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

**REFERENCE BOOKS:**

1. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, 4e , Cengage learning, 2015.
2. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

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**18MAC202 – DISASTER MANAGEMENT  
(AUDITCOURSE-1)**

**M.Tech. CSE I Year, II Semester**

L	T	P/D	C
2	-	-	-

**Prerequisite(s): None.**

**Course Objectives:**

Develop ability to

1. Acquire knowledge on disasters and assess their impact.
2. Comprehend the monitoring techniques of disasters
3. Understand the issues and policies involved in the disaster management.
4. Evaluate the pre-disaster risk and vulnerability reduction strategies.
5. Assess the role of NGO's, Government bodies and Public in the disaster mitigation and Management.

**Course Outcomes (COs):**

At the end of the course, student would be able to

- CO 1: Explain the different types of disasters.
- CO 2: Evaluate the impact of disasters on the community.
- CO 3: Suggest a suitable monitoring technique for disasters.
- CO 4: Recommend appropriate vulnerability reduction strategy and risk reducing techniques.
- CO 5: Estimate the disaster infrastructure development and role of NGO's, Government bodies and Public in the disaster mitigation and management.

**UNIT-I**

**Introduction:** Meaning and Concept of Environmental hazards, Environmental Disasters and Environmental stress. Different approaches and relation with human Ecology - Landscape Approach – Ecosystem Approach – Perception approach – Human ecology and its application in geographical researches.

**UNIT-II**

**Types of Environmental hazards & Disasters:** Natural and Man induced. Natural Hazards – Planetary Hazards/ Disasters – Extra Planetary Hazards/ disasters – Planetary Hazards – Endogenous Hazards – Exogenous Hazards.

**UNIT-III**

**Endogeneous Hazards/ Disasters:** Volcanos –Earthquakes - Landslides – Earthquake Hazards/ disasters – Causes of Earthquakes – Distribution of Earthquakes – Hazardous effects of earthquakes – Earthquake Hazards in India – Human adjustment, perception & mitigation of earthquake.

**UNIT-IV**

**Exogenous Hazards/ Disasters:** Infrequent events – Cumulative atmospheric hazards/ disasters.

**Infrequent events:** Cyclones – Lightning – Hailstorms.

**Cyclones:** Tropical cyclones & Local storms – Destruction by tropical cyclones & local storms (causes, distribution, human adjustment, perception & mitigation)

**Cumulative Atmospheric Hazards/ Disasters:** Floods – Droughts – Cold waves – Heat waves.  
**Floods:** Causes of floods – Flood hazards – Flood control measures (Human adjustment, perception & mitigation).

**Droughts:** Impacts of droughts – Drought hazards in India – Drought control measures.

**Extra Planetary Hazards/ Disasters** – Man induced Hazards/ Disasters – Physical hazards/ Disasters – Soil Erosion.

**Soil Erosion:** Mechanics & forms of Soil Erosion – Factors & causes of soil erosion – Conservation measures of Soil Erosion.

**Chemical Hazards/ Disasters:** Release of toxic chemicals, nuclear explosion – Sedimentation processes:- Global Sedimentation problems – Regional Sedimentation problems – Sedimentation & Environmental problems – Corrective measures of Erosion & Sedimentation.

**Biological hazards/ disasters:** Population Explosion.

#### UNIT–V

**Emerging approaches in Disaster Management** – Three Stages

- 1) Pre-disaster stage (preparedness)
- 2) Emergency Stage
- 3) Post Disaster stage – Rehabilitation

#### TEXT BOOKS:

1. Manual on National Disaster Management Plan, National Disaster Management Authority, Ministry of Home affairs, Government of India.
2. Disaster Management, Dr.Mrinalini Pandey, Wiley India Pvt Ltd., 2014.

#### REFERENCE BOOKS:

1. Disaster Science and Management, Tushar Bhattacharya, McGraw Hill Education, 2015.
2. Disaster Mitigation: Experiences and Reflections, PardeepSahni, PHI Learning, 2010.
3. Natural Hazards and Disasters, Donald Hyndman and David Hyndman, Cengage Learning, 2013.
4. Disaster Management Global Challenges and Local Solutions, Rajib, S and Krishna Murthy, R.R, Universities Press Hyderabad, 2012.
5. Earth and Atmospheric Disaster Management: Nature and Manmade,NavalePandharinath& C.K. Rajan, B.S. Publications, Hyderabad, 2009.
6. Disaster Risk Reduction in South Asia, Sahni and Pardeep, PHI learning Pvt Ltd, 2003.
7. Handbook of Disaster Management: Techniques and Guidelines, B.K. Singh, Rajat Publications, 2008.
8. Disaster Management, G.K. Ghosh, APH Publishing Corporation, 2006.
9. Natural Hazards and Disaster Management: Vulnerability and Mitigation, R.B. Singh, Rawat Publication, 2006.