

**PROGRAM STRUCTURE  
AND  
DETAILED SYLLABUS**

R20 REGULATIONS

**M.Tech (COMPUTER SCIENCE AND ENGINEERING)**

**FOR  
MASTER OF TECHNOLOGY TWO YEAR POST GRADUATE COURSE  
(Applicable for the batches admitted from 2020-2021)**



**ANURAG UNIVERSITY**

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## **Academic Regulations for M.Tech.(Regular) with effect from the Academic Year 2020-21.**

### **1. Eligibility for Admissions**

1. Admission to the M.Tech. program shall be made subject to eligibility, qualification and specialization as prescribed by the Anurag University (AU) from time to time.
2. Admissions shall be made on the basis of merit / rank obtained by the candidates at the qualifying Entrance Test conducted by the University or on the basis of any other order of merit as approved by the University, subject to reservations as prescribed by the Telangana State Private Universities Act (Establishment and Regulations) No.11 of 2018.

### **2. Courses of Study**

The following specializations are offered for the M.Tech program of study:

1. Computer Science and Engineering
2. Electrical Power Systems
3. Embedded Systems
4. Machine Design
5. Power Electronics and Electrical Drives
6. Structural Engineering
7. VLSI System Design

### **3. Course Registration**

- 3.1** Every student is required to be present and register online at the commencement of each semester on the day fixed for and notified in the academic calendar. The students will choose the courses for registration in consultation with the Faculty Advisor. The students may also consult the Head of the Department / Dean of the School.
- 3.2** The registration will be organized departmentally under the supervision of the Head of the Department in coordination with Faculty Advisor.
- 3.3** A student, who does not register on the day announced, may be permitted to register, in consideration of any compelling reason, within the first week. Similarly, a student may be permitted to change the registration for a course within the first week only in consultation with respective faculty advisor. No late registration/change of registration shall be permitted after the first week

from the scheduled date.

- 3.4** Only those students will be permitted to register who have: (a) cleared all University and Hostel dues of the previous semesters (b) paid all required fees for the current semester, and (c) not been debarred from registering for a specified period on disciplinary action or any other ground.
- 3.5** A candidate shall be given one chance to re-register and attend the classes for a maximum of two courses, if the CIE marks secured by a candidate are less than 50% and failed in those subjects but fulfilled the attendance requirement. A candidate must re-register for failed courses within four weeks of commencement of the class work and secure the required minimum attendance to appear for SEE. In the event of the student taking this chance, his CIE marks and SEE marks obtained in the previous attempt stand cancelled.
- 3.6** Dropping of courses: Within four weeks after the commencement of the semester, the student may, in consultation with the faculty advisor, drop one or more courses. The dropped courses shall be registered in the subsequent semesters as and when it is offered.

#### **4. Attendance**

- 4.1** Attendance in all classes (lectures/tutorials, laboratories etc.) is compulsory. A student will not be permitted to appear in the semester end examination on grounds of unsatisfactory attendance. Minimum required attendance in each theory / laboratory course is 75% (including the days of attendance in sports, games, and NCC and NSS activities) for appearing in the semester end examination. Students are advised to monitor the status of their attendance in the online system from time to time. Absence without obtaining sanction of leave will be considered as an act of indiscipline.
- 4.2** Condonation of shortage of attendance in each course up to 10% (65% and above and below 75%) in each semester shall be granted on genuine medical grounds and valid reasons on representation by the candidate with supporting documentary evidence.
- 4.3** Shortage of attendance below 65% in each course shall not be condoned.
- 4.4** Students whose shortage of attendance is not condoned in any course are not

eligible to appear for their semester end examination of that course and their registration shall stand cancelled.

**4.5** However, in respect of women candidates who seek condonation of attendance due to pregnancy, the Vice-Chancellor may condone the deficiency in attendance to the extent of 15% (as against 10% condonation for others) on medical grounds subject to submission of medical certificate to this effect. Such condonation shall be availed only twice during the program of study.

**4.6** A prescribed fee shall be payable towards condonation of shortage of attendance.

**4.7** A candidate shall get minimum required attendance at least in three (3) theory courses in the present semester to get promoted to the next semester.

**4.8 Promotion Rules:**

4.8.1 A student shall be promoted from I Year to II Year only if he/she fulfills the academic requirements of securing 50% of average credits up to I Year II Semester, from all the examinations, whether or not the candidate takes the examinations.

4.8.2 A student shall register and put up required attendance in all 88 credits and earn all 88 credits for the award of degree.

4.8.3 Students, who fail to earn 88 credits as indicated in the course structure within four academic years from the year of their admission, shall forfeit their admission.

**4.9** When a student is detained due to shortage of attendance in any semester, no grade allotments or SGPA/CGPA calculations will be done for that entire semester in which he/she got detained.

**4.10** When a student is detained due to lack of credits in any year, he / she may be readmitted after fulfillment of the academic requirements, with the academic regulations of the batch into which he / she gets readmitted.

**4.11** For readmitted candidates, if there are any professional electives / open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the set of elective courses offered under that category.

## 5. Assessment of Academic Performance

5.1 The performance of a student in a semester shall be evaluated course-wise for a maximum of 100 marks in each theory and practical course. In addition, Seminars, Comprehensive Viva-Voce, Technical Paper writing, Project Work Reviews and Project Work shall be evaluated for 100 marks each. The distribution of marks for Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE) along with the minimum pass percentage shall be as follows:

Course	Continuous Internal Evaluation (CIE)	Semester End Examination (SEE)	Minimum Requirements to	academic Pass a Course
			*Minimum Pass Percentage (SEE)	*Minimum Pass Percentage (CIE+SEE)
Theory	40	60	40	50
Laboratory / Practicals	50	50	40	50
Seminars	100	0	-	50
Comprehensive Viva-Voce	-	100	50	<b>50</b>
Technical Paper Writing	100	-	-	50
Project Reviews	100	-	-	50

\*Provided a relaxation of 10% of maximum marks shall be given to physically challenged students.

5.2 Each theory course in a semester is evaluated for 100 marks, with the following weightages:

### 5.2.1 Continuous Internal Evaluation(CIE)

The CIE for Theory Courses has the following three components, comprising of 40 marks:

- a. Midterm Examinations for 20marks
- b. Quizzes for 10marks
- c. Assignment / Seminars / Projects / Group Activities for 10 marks
- d. Mid-term Examinations

There shall be two midterm examinations of 20 marks each. The average of the two examinations shall be taken as the marks secured by each candidate. Each midterm examination shall be conducted for the duration of 90 minutes and the question paper consists of Part-A (Short Answers for 5 marks) consists of 5 questions carrying 1 mark each, and Part-B (Long Answers for 15 marks) containing 5 questions of which student has to answer 3 questions; each question carrying 5 marks.

The First midterm examination shall be conducted for 2.5 units of syllabus at the end of 8 weeks of instruction and Second midterm examination shall be conducted for remaining 2.5 units at the end of 16 weeks of instruction.

In case any student has missed one of the two examinations, or wants to improve in one of the examinations, an optional third midterm examination will be conducted. This optional third midterm examination will be conducted during the preparation cum external practical examinations period subject to the following conditions:

1. Interested students have to register for the third mid examination by paying the prescribed registration fee.
2. Third midterm examination covers entire semester syllabus carrying 20marks

**a. Quizzes:**

There shall be a total of five quizzes of 10 marks each. The quiz is to be conducted at the end of each of the five units of instruction. The average of the five quizzes shall be taken as the final marks secured by each candidate.

**5.2.2 Assignment / Seminars / Projects / Group Activities:**

The faculty will evaluate the students for 10 marks by conducting any of the following in two phases covering at least two units in each phase: Assignments / Seminars / Projects / Group Activities. This should be completed before the conduct of second mid-term examination.

**5.2.3 Semester End Examination**

- a. The semester end examination will be conducted for 60 marks. The question paper will consist of two parts viz.,i) Part-A for 20marks, ii) Part –B for 40 marks.
- b. Part-A is compulsory, which consists of ten questions (numbered from 1 to 10), two questions from each unit carrying 2 marks each.
- c. Part-B consists of five questions (numbered from 11 to 15) shall be set by covering one question (may contain sub-questions) from each unit of the syllabus carrying 8 marks each. For each question there will be an“either”“or”choice (that means there will be two questions from each unit and the student shall have to answer any one of them).

- 5.3** Each laboratory course in a semester is evaluated for 100 marks, with the following weightages:
- a. Throughout the semester the student will be evaluated for 50 marks under CIE as follows:
- i. Preparation for Lab – 10 marks.
  - ii. Observation – 10 marks.
  - iii. Completion of Experiment – 5 marks.
  - iv. Record –5 marks.
  - v. Skill Test – 20 Marks

Before the end of instruction a Skill Test will be conducted for 20 marks. The practical SEE shall be conducted for 50 marks with an examiner along with the lab faculty. The examiner shall be appointed by the Dean (Examinations) of the University.

- 5.4** There shall be two seminar presentations during I Year I Semester and I Year II Semester. For each Seminar there will be only internal evaluation of 100 marks. Students shall present a seminar before the faculty members assigned for the purpose.
- 5.5** There shall be a Comprehensive Viva-Voce in II year I Semester. The Comprehensive Viva-Voce is intended to assess the students' understanding of various courses he has studied during the program. Comprehensive viva-voce will be taken by the faculty members assigned for the purpose.
- 5.6** There shall be a Technical Paper Writing that covers concepts of abstract, introduction, material and methods, conclusion, references, acknowledgement etc. The report shall be presented as a printed document for evaluation. Evaluation shall done by the faculty member assigned for the purpose
- 5.7** There shall be a project work review I and II in 2nd Year first and second semester respectively. For the Project work Reviews there is an internal marks of 100, the evaluation should be done by the Project Review Committee (PRC) for 50 marks and Supervisor will evaluate for 50 marks.
- 5.8** A candidate shall be given one chance to re-register for the courses if the internal marks secured by a candidate is less than 50% and failed in that course for maximum of two times. In the event of the student taking another chance, his / her CIE and SEE marks obtained in the previous attempt stands cancelled.



**5.9** If there is a complaint in awarding the CIE marks, the University shall nominate a committee to look into the matter.

**5.10** Candidates shall be permitted to apply for recounting/revaluation of SEE theory-scripts within the stipulated period with payment of prescribed fee.

**5.11** Recounting: The totaling of the marks awarded shall be verified in the answer script and corrected if there is any mistake.

**5.12 Revaluation**

- a) The answer scripts of the candidate who applied for revaluation are evaluated by two subject experts independently other than the original evaluator.
- b) If the difference of marks between these two valuations is 15% or more, it will be sent for third valuation to another subject expert.
- c) Nearest of two valuations out of three will be considered and the average of these two will be taken as the final marks obtained.
- d) If the difference of the final marks and original marks after revaluation is 15% or more of maximum marks, then the revaluation marks are considered for declaring the result.
- e) If the revaluation marks are less than the original marks, the original marks are retained and there is no change in the result.

**5.13 Challenge Valuation:**

The candidates who have applied for revaluation and are not satisfied with the result are only eligible to apply for challenge valuation by paying the prescribed fee in the form of DD payable to the Registrar, AU.

- a) On receipt of the DD, a photocopy of the answer booklet shall be given to the student.
- b) The paper will be evaluated in the presence of the student by a senior faculty member appointed by the University.
- c) If there is any change in the marks  $\geq 15\%$  of the maximum marks, the new marks will be awarded to the student. Otherwise, there will be no change in original secured marks.
- d) If the change in marks (equal or above 15% of the maximum marks) occurs, the amount paid towards challenge valuation will be refunded. Otherwise, the student will forfeit the total amount which he/she has paid.

## 6. The Grading System

6.1 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 (Class Intervals)	Letter Grade (as per 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
Absent	Ab	0

6.2 In general, a student shall not be permitted to repeat any course(s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA improvement'.

6.3 The 'Credit Points' (CP) for a course, is computed by multiplying the Grade Point with Credits for that particular course.

$$\text{Credit Points (CP)} = \text{Grade Point (GP)} \times \text{Credits}$$

6.4 The Student passes the course only when he/she gets GP  $\geq 6$  (B Grade or above).

6.5 The Semester Grade Point Average (SGPA) is calculated as follows

$$SGPA = \frac{\{\sum_{i=1}^N C_i G_i\}}{\{\sum_{i=1}^N C_i\}}$$

where 'i' is the course indicator index (takes 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 is the no. of Credits allotted to the i<sup>th</sup> course, and G represents the Grade Points (GP) corresponding to the Letter Grade awarded for that course.

- 6.6** The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all semesters considered for registration. The CGPA is calculated as follows:

$$CGPA = \frac{\{\sum_{j=1}^M C_j G_j\}}{\{\sum_{j=1}^M C_j\}}$$

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 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 (takes into account all courses from 1 to S Semesters), C is the no. of credits allotted to the j<sup>th</sup> course, and G represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j<sup>th</sup> 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.

- 6.7** For CGPA and SGPA calculations performance in failed courses (securing F Grade) will also be taken into account, and the Credits of such courses will also be included in the multiplications and summations.

## **7. Passing Standards**

- 7.1 A student shall be declared successful or 'passed' in a Semester, only when he/she gets a SGPA  $\geq 6.00$  (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire UGP, only when he/she gets a CGPA  $\geq 6.00$ ; subject to the condition that he/she secures a GP  $\geq 6$  (B Grade or above) in every registered course in each Semester.
- 7.2 After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, No. of credits, grade earned etc.), credits earned, SGPA and CGPA.

## **8. Evaluation of Project/Dissertation Work**

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

- 8.1 A Project Review Committee (PRC) shall be constituted with Head of the Department as Chairman, Project Supervisor and two senior faculty members.
- 8.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses, both theory and practical.
- 8.3 After satisfying 8.2, a candidate has to submit, in consultation with his Project Supervisor, the title, objective and plan of action of his project work to the PRC for approval. Only after obtaining the approval of the PRC the student can initiate the Project work.
- 8.4 If a candidate wishes to change his supervisor or topic of the project, he/she 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.
- 8.5 A candidate shall submit his project status report in two stages at least with a gap of 3 months between them.
- 8.6 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 candidate is permitted to submit Project Thesis only after successful completion of all theory and practical courses with the approval of PRC not earlier than 40 weeks from the date of registration of the project work. For the approval of PRC the candidate shall submit the draft copy of thesis to the Head of the Department and make an oral presentation before the PRC.
- 8.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the University.
- 8.8 After approval from the PRC, a soft copy of the thesis should be submitted for PLAGIARISM check and the plagiarism report should be submitted to the examination branch and be included in the final thesis. The thesis will be accepted for submission, if the similarity index is less than 30%. If the similarity index has more than the required percentage, the student is advised to modify accordingly and re-submit the soft copy of the thesis after one month. The maximum number of re-submissions of thesis after plagiarism check is limited to TWO. The candidate has to register for the project work and work for two semesters. After two attempts, the admission is liable to be cancelled.

- 8.9 For Project Evaluation (Viva Voce) in II Year II Sem. there is an external mark of 100 and the same evaluated by the External examiner appointed by the Institution. The candidate has to secure minimum of 50% marks in Project Evaluation (Viva-Voce) examination.
- 8.10 If he/she fails to fulfill the condition as specified in 8.9, he/she shall reappear for the Viva-Voce examination only after three months. In the reappeared examination also, fails to fulfill the above said condition, he/she will not be eligible for the award of the degree.
- 8.11 The thesis shall be adjudicated by one examiner appointed by the Dean-Examinations from the list of panel of examiners approved by the Vice-Chancellor. For this, Chairman, Board of Studies of the respective departments shall submit a panel of 3 examiners, who are eminent in that field with the help of the concerned guide and senior faculty of the department.
- 8.12 If the report of the examiner is unfavorable, the candidate shall revise and resubmit the Thesis. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected.
- 8.13 If the report of the examiner is favorable, 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.
- 8.14 The Head of the Department shall coordinate and make arrangements for the conduct of Project Viva-Voce examination.

## **9 Award of Degree and Class**

- 9.1 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 Program (PGP), and secures the required number of Credits 88 (with CGPA  $\geq$  6.0), shall be declared to have 'QUALIFIED' for the award of the M.Tech Degree in the chosen Branch of Engineering and Technology with specialization as he/she admitted.

### **9.2 Award of Class**

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

<b>CGPA</b>	<b>Class</b>	<b>Condition</b>
$\geq 8.00$	First Class with Distinction	<ul style="list-style-type: none"> <li>Should have passed all the courses in 'first appearance' in a semester examinations and should complete the program in 2 years of time.</li> <li>Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason.</li> </ul>
$\geq 6.75 - < 8.00$	First Class	<ul style="list-style-type: none"> <li>The Students who secure <math>CGPA \geq 8.00</math>, but not fulfilling above conditions for "First Class with Distinction" shall be awarded "First Class"</li> </ul>
$\geq 6.00 - < 6.75$	Second class	

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

## **10 Withholding of Results**

If the student has not paid the dues, if any, to the institution or if any case of indiscipline is pending against him/her, the result of the student will be withheld and he/she will not be allowed into the next semester. His/her degree will be withheld in such cases.

## **11 Transitory Regulations**

11.1 Discontinued, detained or failed candidates are eligible for readmission / re-registration as and when offered next as per the University admission procedure.

11.2 The candidate who fails in any course has to complete the same course / equivalent course in the maximum stipulated time as per the Regulations in vogue.

## **12 Convocation**

12.1 The University shall conduct convocation to confer the degree(s).

12.2 The University shall institute Prizes and Awards to meritorious students during convocation.

## **13 Amendments**

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

## **ANNEXURE – I: Disciplinary Action against Students – Provisions**

- A. Student's behavior and discipline will be assessed and will receive the same attention as the academic work. Discipline includes the observance of good conduct and orderly behavior by the students of the University;
- B. All students pursuing a Program at the University shall observe code of conduct and maintain discipline and must consider it as a duty to behave decently at all places;
- C. Every student shall always carry the Identity card issued by the university. Every student shall have to produce or surrender the identity card, as and when required by the proctorial staff, teaching and library staff and the officials of the university. The loss of the identity card, whenever it occurs, shall immediately be reported in writing to the Registrar.
- D. Any violation of the code of conduct or breach of any rules and regulations of the university is construed as an act of indiscipline and shall make him/her liable for disciplinary action;
- E. The following acts are treated as gross indiscipline;
  - a) Disobeying the teacher/officials or misbehaving in the class;
  - b) Quarrelling or fighting in the University campus, hostels amongst themselves, indulging in any activity which amounts to ragging or Harassment of other students;
  - c) Quarrelling or fighting with a University employee(s) or any other public utility functionaries in the campus;
  - d) Indecent behavior in the University campus or outside causing inconvenience to others;
  - e) Visiting socially unacceptable websites, smoking or consuming liquor or banned substances like drugs etc. ;
  - f) Damage to the University property;
  - g) Indulging in acts of theft, forgery, stealing and misappropriating;
  - h) Any other activity that defames the University;
    - i. Use of mobile in the class/academic area.
    - ii. irregularity in attending classes, persistent idleness, negligence or indifference towards the work assigned;
    - iii. Any other conduct which is considered to be unbecoming of a student.
- F. Rules for Students Conduct & Behavior in Campus and Outside;
- G. The rules and regulations, academic calendar shall be provided to all the students
- H. In general, Dean, Student Affairs will deal with the welfare and discipline of all students in the campus including Hostel and also outside the campus and will ensure maintenance of

good conduct. He/ She will be assisted by other members of faculty/ staff/ wardens as nominated;

I. Conduct and Behavior:

- a) Students should attend all their classes and strictly observe class timings. They should likewise carry out other out-door and extracurricular duties assigned to them. Their attendance and leave is governed by the regulations pertaining to them;
- b) Students must give their undivided attention to their academic work and must be respectful to their teachers and supervisors;
- c) Students must conduct themselves with due decorum in the classes, laboratories, Library etc. and move in an orderly and disciplined manner in the campus;
- d) Students should not indulge in abusive behavior/ violence of any kind with fellow students, teaching faculty and employees of the University within or outside the University. Violence by any student or group of students will lead to severe disciplinary action;
- e) No meeting of the students other than those organized under the aegis of the various recognized students' activities shall be called without the prior permission in writing from the Dean, Student Affairs;
- f) Neither meetings/functions within the University campus shall be organized nor any outsider address the students without the prior permission in writing from the Registrar;
- g) No students shall use unfair means at any of the examinations and tests or attempt or threaten the staff to get undue advantage;
- h) Students must pay all fees and other dues on specified dates. If they do not do so, they render themselves liable to penalties as in force from time to time;
- i) Students must take good care of all University property. Any damage to University property shall be viewed as indiscipline. Such student(s), in addition to facing the disciplinary action, shall have to replace the damaged property and make good the losses caused due to their action. Students must use the furniture and fittings with due care and must not deface buildings, roads, furniture and fittings etc. in any manner;
- j) Students must handle the laboratory equipment, instruments and machinery with great care. Any damage or breakage of such equipment etc., due to improper use or negligent handling will have to be made good by the students concerned;



- k) Ragging in any form is unlawful and strictly prohibited. If a student found ragging shall be punished as per the Anti-Ragging Act;
- l) The University shall have a zero-tolerance policy towards Ragging and shall lay down strict guidelines on the same as per policies of the UGC in vogue and in compliance to directions of Hon'ble Supreme Court;
- m) Mobile cellular phone may be carried by the students. However, they shall be kept in silent mode during the classes. Violation will lead to confiscation of the mobile phone;
- n) All the students are required to observe the decorum in the dress code as prescribed by the University. Students not adhering to the prescribed dress code may be denied entry to the University campus;
- o) Smoking, consumption/possession of liquor, intoxicants, drugs, cigarettes, hookah etc., inside or outside the Campus is strictly prohibited. Any violation will invoke severe penalty including rustication from the Hostel/ University.

J. Policy to prevent Sexual Harassment:

- a) The University shall be committed to treating every employee and student with dignity and respect. It shall seek to create a work environment that is free from sexual harassment of any kind, whether verbal, physical or visual;
- b) A policy shall be prescribed by the University to provide guidelines for prompt redressal of complaints related to sexual harassment which should be in full compliance with "The Sexual Harassment of Women at Workplace (Prevention, Prohibition & Redressal)" Act, 2013;
- c) All references / complaints and redressal mechanism pertaining to any matter will be handled within the ambit of the said Act and the Rules framed thereunder. The policy so prescribed shall be communicated to all employees and students.

K. Grievance and Redressal Mechanisms:

The University shall constitute various Grievance and Redressal committees and its guidelines as specified by the statutory authorities of the University.

## ANNEXURE – II: Malpractices Rules

S.No	Nature of Malpractice Improper conduct during examinations	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he/she 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 subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other 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 subject only of all the candidates involved. In case of an outsider, he/she will be handed over to the police and a case is registered against him/her.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate disappearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The hall ticket of the 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 subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he/she will be handed over to the police and a case is registered against him/her.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination. Takes away answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the 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 for two consecutive semesters from class work and all SEEs. 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 subject.
6	Refuses to obey the orders of the Chief Superintendent / Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty inside or outside the examination hall or causing any injury to himself / herself or to any others or threatens 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 others, 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.	They shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case will be registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears the script or any part-thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work & shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester 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 subject and all other subjects 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 these at.
9.	Who is not a candidate for the particular examination or any person not connected with the University indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects 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 University will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the 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.
11.	Found copying, on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the malpractice committee for further action on suitable punishment as per rules.	

### **ANNEXURE –III: Definitions**

In these Regulations, unless the context otherwise requires:

- a. Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year
- b. Choice Based Credit System (CBCS): The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses)
- c. Course: Usually referred to, as a 'course' is a component of a program. All courses neednot carry the same weightage. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/tutorials/laboratory work/field work/outreach activities/ project work/vocational training/viva/seminars/term papers/assignments/ presentations/self- study etc., or a combination of some of these
- d. Credit Based Semester System (CBSS): Under the CBSS, the requirement for awarding a degree or diploma or certificate is prescribed in terms of number of credits to be completed by the students
- e. 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
- f. Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale
- g. Credit Point: It is the product of grade point and number of credits for a course
- h. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters i.e., O, A+, A, B+, B, C and F
- i. Semester Grade Point Average (SGPA): It is a measure of academic performance in a semester. It is the ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places
- j. Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student. The CGPA is the ratio of total credit points secured by a student in all semesters and the sum of the total credits. It shall be expressed up to two decimal places
- k. Program: An academic program of the University
- l. Semester: Each semester shall consist of 16 weeks of instruction.
- m. Transcript or Grade Card or Certificate: Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate

will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester

- n. Types of courses: The courses in a program may be of three kinds: Core, Elective and Foundation
- o. Core course: This is the course which is to be compulsorily studied by a student as a core requirement of a program in a branch of study
- p. Elective course: This is the course to be chosen from a pool of courses. Elective course may be (a) Supportive to the branch of study (b) Providing an expanded scope (c) Enabling an exposure to some other branch/domain (d) Nurturing student's proficiency/skill
- q. Foundation course: This course may be of two kinds, compulsory foundation and elective foundation
- r. Compulsory Foundation courses: These are the courses based upon the content that leads to knowledge enhancement. They are mandatory for all disciplines
- s. Elective Foundation courses: These are value-based and are aimed at man-making education
- t. The academic regulations should be read as a whole for the purpose of any interpretation.
- u. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chancellor is final.

**M.TECH (CSE) I YEAR I SEM**

<b>S.No.</b>	<b>CODE</b>	<b>Category</b>	<b>Course title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
1	A31001	PCC	Advanced Algorithms	3	0	0	3
2	A31002	PCC	Artificial Intelligence	3	1	0	4
3	A31003 A31004 A31005 A31006	PEC-1	1.Machine Learning 2.Data science and Analytics 3.Internet of Things 4. Computer Vision	3	1	0	4
4	A31007 A31008 A31009 A31010	PEC-2	1.Cloud Computing 2.Cryptography 3.Database Management systems 4.Computer Networks	3	0	0	3
5	A31011 A31012 A31013	OEC-I	1.Entrepreneurship Development 2.Project Management 3.Principles of Computer Communications and Networks	3	0	0	3
6	A31201	PCC Lab	Advanced Algorithms Lab	0	0	6	3
7	A31202 A31203 A31204 A31205	PEC1- Lab	1.Machine Learning Lab 2.Data science and Analytics Lab 3.Internet of Things Lab 4. Computer Vision Lab	0	0	6	3
8	A31206	Seminar- 1	Seminar-1	0	0	4	2
<b>Total</b>				<b>15</b>	<b>2</b>	<b>16</b>	<b>25</b>

## M.Tech (CSE) I YEAR II SEM

S.No.	CODE	Category	Course title	L	T	p	Credits
1	A32001	PCC	Information Security	3	1	0	4
2	A32002	PCC	Software Engineering	3	1	0	4
3	A32003 A32004 A32005 A32006	PEC-III	1.Deep Learning 2.Block Chain Technology 3.Natural Language Processing 4.Big Data	3	1	0	4
4	A32007 A32008 A32009	OEC-II	1.Intellectual Proper Rights 2.Value Engineering 3. Embedded System Design	3	0	0	3
5	A32201	PCC-Lab	Information Security Lab	0	0	4	2
6	A32202	PCC-Lab	Software Engineering Lab	0	0	6	3
7	A32203 A32204 A32205 A32206	PEC-III-Lab	1.Deep Learning Lab 2.Block Chain Technology Lab 3.Natural Language Processing Lab 4.Big Data Lab	0	0	6	3
8	A32207	Seminar-II	Seminar-II	0	0	4	2
<b>Total</b>				<b>12</b>	<b>3</b>	<b>20</b>	<b>25</b>



### M.Tech (CSE) II YEAR I SEM

<b>CODE</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
A33201	Technical Paper Writing	0	2	0	2
A33202	Comprehensive Viva-Voce	0	0	0	4
A33203	Project work Review I	0	0	16	8
<b>Total</b>		<b>0</b>	<b>2</b>	<b>16</b>	<b>14</b>

### M.TECH (CSE) II YEAR II SEM

<b>CODE</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
A34201	Project work Review II	0	0	16	8
A34202	Project Evaluation (Viva-Voce)	0	0	0	16
<b>Total</b>		<b>0</b>	<b>0</b>	<b>16</b>	<b>24</b>

# ADVANCED ALGORITHMS

(PCC)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	0	3

## Course Objectives:

1. Understand various static and dynamic representations of data structures.
2. Know the basic concepts of Hashing.
3. To introduce various techniques for representation of the data in the real world.
4. To be familiar with Graph representations and traversals.
5. Compute the complexity of various algorithms

## Course Outcomes:

1. Design and implement the mechanism of stacks, general tree data structures with their applications.
2. Outline the concepts of hashing, collision and its resolution methods using hash Function.
3. Implement various algorithms on graph data structures.
4. Implementation of various advance concepts of binary trees with real time applications.
5. Determine and analyse the complexity of given Algorithms

## UNIT I

Algorithms, Performance analysis- time complexity and space complexity, Asymptotic Notation- Big Oh, Omega and Theta notations, Complexity Analysis Examples. Data structures- Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, Vector representation, singly linked lists -insertion, deletion, search operations, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two dimensional arrays, Sparse matrices and their representation.

## UNIT II

Stack and Queue ADTs, array and linked list representations, infix to postfix conversion using stack, implementation of recursion, Circular queue-insertion and deletion, Dequeue ADT, array and linked list representations, Priority queue ADT, implementation using Heaps, Insertion into a Max Heap, Deletion from a Max Heap, java.util package-ArrayList, LinkedList, Vector classes, Stacks and Queues in java.util, Iterators in java.util.

## UNIT III

Searching-Linear and binary search methods, Hashing-Hash functions, Collision Resolution methods-Open Addressing, Chaining, Hashing in java.util-HashMap, HashSet, Hashtable. Sorting -Bubble sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort, comparison of sorting methods.

## UNIT IV

Trees- Ordinary and Binary trees terminology, Properties of Binary trees, Binary tree ADT, representations, recursive and non recursive traversals, Java code for traversals, threaded binary

trees.

Graphs- Graphs terminology, Graph ADT, representations, graph traversals/search methods-DFS and BFS, Java code for graph traversals, Applications of Graphs-Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for Single Source Shortest Path Problem.

## **UNIT V**

Search trees- Binary search tree-Binary search tree ADT ,insertion, deletion and searching operations, Balanced search trees, AVL trees-Definition and examples only, Red Black trees – Definition and examples only, B-Trees-definition, insertion and searching operations, Trees in java.util-TreeSet, TreeMap Classes, Tries(examples only),Comparison of Search trees.  
Text compression-Huffman coding and decoding, Pattern matching-KMP algorithm.

## **TEXT BOOKS:**

- 1.Data structures, Algorithms and Applications in Java, S.Sahni, Universities Press.
- 2.Data structures and Algorithms in Java, Adam Drozdek, 3<sup>rd</sup> edition, Cengage learning.
- 3 Data structures and Algorithm Analysis in Java, M. A. Weiss, 2<sup>nd</sup> edition, Addison-Wesley (Pearson Education).

## **REFERENCE BOOKS:**

- 1Java for Programmers, Deitel and Deitel, Pearson education.
- 2Data structures and Algorithms in Java, R.Lafore, Pearson education.
- 3java: The Complete Reference, 8<sup>th</sup> edition, Herbert Schildt, TMH.
- 4Data structures and Algorithms in Java, M. T. Goodrich, R. Tomassia, 3<sup>rd</sup> edition, Wiley India Edition
- 5.Data structures and the Java Collection Frame work, W. J. Collins, Mc Graw Hill.
- 6.Classic Data structures in Java, T.Budd, Addison-Wesley (Pearson Education).
7. [www.tutorialspoint.com/Data Structures Algorithms](http://www.tutorialspoint.com/Data Structures Algorithms)

# ARTIFICIAL INTELLIGENCE

(PCC)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	1	4

## Course Objectives:

1. To have a understanding of both the achievements of AI Systems and the theory underlying those achievements for the engineering issues.
2. To have an understanding of the basic issues of problem solving by using search policies as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs.
3. To have an understanding of the basic issues of knowledge representation and blind
4. To have a basic understanding of some of the more advanced topics of AI such as learning, agents and robotics, expert systems, and planning.

## Course Outcomes:

Students will be able to

1. Understanding of the major areas, ethical issues and challenges of AI.
2. Ability to apply basic AI search algorithms to solve problems.
3. Formalize a given problem in the language/framework of different AI methods (e.g. as a logical theory, as a planning problem, etc)
4. Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
5. Design and carry out an empirical evaluation of AI algorithms on a problem formalization, and state the conclusions that the evaluation supports

**UNIT-I: Introduction to Artificial Intelligence:** Introduction and Foundations of Artificial Intelligence, Brief History, Risks and Benefits, Intelligence Agents: Agents and Environments, Nature of Environments, Structure of Intelligence Agents.

**UNIT-II: Problem Solving by Search :** Formalism of State Space, Search Algorithms, Uninformed Search Strategies, Informed(Heuristics) Search Strategies, Heuristics Functions, Local Search: Hill Climbing, Simulated Annealing, Genetic Algorithms, Adversarial Search: Two-Agent Games, MiniMax Search Algorithm, Heuristic Alpha-Beta Tree Search Algorithm,

Monte Carlo Algorithm, Constraint Satisfaction Problems:Defining CSP, Inferences, Back Tracking Search and Local Search for CSPs.

**UNIT-III: Knowledge Representation:** Knowledge-Based Agents, Propositional Logic: Syntax, Semantics, Inference and Proofs, Proof by Resolution, Model Checking, First-Order Logic:Syntax and semantics, Usage of First-Order Logic, Knowledge Engineering process, Inferences: Propositional vs First-Order Inference, Backward Chaining and Forward Chaining. .

**UNIT-IV: Probabilistic Reasoning and Decision Making theory:** Uncertainty: Notation & Axioms of Probability, Bayes Rule and its Use for Text Classification, Bayesian Networks: Representation and semantics, Fuzzy Sets and Fuzzy Logic, Hidden Markov Models(HMM), Markov Decision Process(MDP): MDP Formulation, Utility Theory, Utility Functions, Value Iteration, Policy Iteration

**UNIT-V: Learning and Applications:** Learning Forms: Introduction to Supervised Learning,and Unsupervised Learning, Reinforcement Learning: Passive and Active Learning, Generalization, Policy Search and its Applications, Introduction to Learning using ANN,

**Text Books:**

1. Stuart Russell Peter Norvig “Artificial Intelligence” A Modern Approach ,Third Edition Pearson Education .
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill

**Reference Books:**

1. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan-Kaufmann.
2. Trivedi, M.C., “A Classical Approach to Artificial Intelligence”, Khanna Publishing House
3. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011
4. <https://www.cin.ufpe.br/~tf12/artificial-intelligence-modern-approach.9780131038059.25368.pdf>

# MACHINE LEARNING

## (PEC-I)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	1	4

### Course Objectives:

To understand the need for machine learning for various problem solving

1. To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
2. To understand the latest trends in machine learning
3. To design appropriate machine learning algorithms for problem solving

### Course Outcomes:

Student will be able to:

1. Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
2. Discuss the decision tree algorithm and identify and overcome the problem of overfitting
3. Apply the back propagation algorithm and genetic algorithms to various problems
4. Usage of Bayesian concepts to machine learning
5. Analyse the appropriate machine learning approaches for various real time problems

### UNIT I :

#### Introduction:

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

### UNIT II :

#### Neural Networks and Genetic Algorithms

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

### **UNIT III :**

#### **Bayesian and Computational Learning**

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

### **UNIT IV :**

#### **Instant Based Learning**

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

### **UNIT V :**

#### **Advanced Learning**

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

### **TEXT BOOK:**

1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

### **REFERENCES:**

1. EthemAlpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
3. <http://www.cs.cmu.edu/~tom/mlbook.html>

# DATA SCIENCE AND ANALYTICS

(PEC-I)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	1	4

## Course Objectives:

1. To gain a foundational understanding of data science.
2. To understand the data exploration analysis in data science.
3. To understand and use basic machine learning algorithms for predictive modeling.
4. To understand and use the various graphics in R and Tableau for data visualization.
5. To understand the ethical and privacy issues in data science.

## Course Outcomes:

At the conclusion of the course, students should be able to:

1. Describe what Data Science is and the skill sets needed to be a data scientist.
2. Explain the significance of exploratory data analysis (EDA) in data science.
3. Apply basic machine learning algorithms for predictive modeling.
4. Learn to persuade effective visualization of given data.
5. Reason around ethical and privacy issues in data science conduct and apply ethical practices.

## Unit I:

### INTRODUCTION TO DATA SCIENCE

Introduction: What is Data Science, Big Data and Data Science hype – and getting past the hype, Why now? – Datafication, Current landscape of perspectives, Skill sets needed, Statistical Inference, Populations and samples, Statistical modeling, probability distributions, fitting a model, Introduction to R.

## Unit II:

### EXPLORATORY DATA ANALYSIS AND THE DATA SCIENCE PROCESS

Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study.



### **Unit III:**

#### **BASIC MACHINE LEARNING ALGORITHMS**

Linear Regression, k-Nearest Neighbors (k-NN), k-means, Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam.

### **Unit IV:**

#### **DATA VISUALIZATION**

Basic principles, ideas and tools for data visualization, Examples of inspiring (industry) projects, Introduction to Tableau. Creating own visualization of a complex dataset.

### **Unit V:**

#### **DATA SCIENCE AND ETHICAL ISSUES**

Discussions on privacy, security, ethics, A look back at Data Science, Next-generation data scientists.

### **Text Books:**

1. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly. 2014.
2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.

### **Reference Books:**

1. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009.
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012.
4. <https://docs.google.com/file/d/0B6iefdnF22XQeVZDSkxjZ0Z5VUE/edit?pli=1>

# INTERNET OF THINGS

(PEC-I)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	1	4

## Course Objectives:

1. To understand the basics of Internet of Things and IoT enabled Technologies
2. To get an idea of IoT and M2M
3. To understand the Logical Design using Python
4. To understand the IoT Physical Devices and Endpoints
5. To understand the concepts of IoT Physical Servers and Cloud Offerings

## Course Outcomes:

Student will be able to:

1. Understand the basic concepts of Internet of Things and IoT enabled Technologies
2. Compare IoT and M2M
3. Compressive knowledge of Logical Design using Python
4. Experience programming of Raspberry Pi devices
5. Describe the IoT Physical Servers and Cloud Offerings

## 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

Webserver – 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, ArshdeepBahga and Vijay Madiseti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

## **COMPUTER VISION (PEC- I)**

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	1	4

### **Course Objectives:**

1. To review image processing techniques for computer vision and image filtering
2. To understand camera views and image texturing
3. How to recognize the objects using features derived from image.
4. Clear view of 3D model of image

### **Course outcomes:**

The students will be able to

1. Understand the basics of image processing techniques required for computer vision
2. Acquire the knowledge of camera, Texture and image filtering
3. Apply the various features derived from the image for recognition of objects
4. Apply the knowledge of image color and edge techniques
5. To develop the application of computer vision using SVM and 3D vision

### **UNIT I :**

Introduction to Computer Vision: Overview and State-of-the-art, The Four Rs of Computer Vision, Geometry of Image Formation, Digital Image Formation and low-level processing, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Classification of image processing operations- Arithmetic operations, Logical operations.

### **UNIT II:**

Depth estimation and Multi-camera views, Robust Correspondence Estimation, Perspective, Edge Detection, Binocular Stereopsis: Camera and Epipolar Geometry;

Texture: Representation of texture, Analysis of using oriented pyramids, synthesizing texture and shape from texture.

Image Filtering: Linear filters and convolutions, shift invariant linear system, spatial frequency, sampling and aliasing, Filters as Templates.

### **UNIT III :**

Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

Recognition: Building blocks, Detectors and Descriptors, SIFT & Single Object Recognition, Optical Flow & Tracking, Introduction to Object Recognition and Bag-of Words Models, Constellation model, foot-of-normal method – line localization – line fitting

### **UNIT IV:**

Use of Surface Smoothness Constraint; sources and their effects, local shading models

Edge detection: Noise, estimation derivatives, detecting edges, Feature Extraction, Edges - Canny, LOG, DOG;

Color : The physics of color , Human color perception, representing color and color models – like RGB, HSV and **CMYK** models, Face Detection, Image Segmentation, Feature Tracking & Motion Layers.

### **UNIT V:**

Recognition: Objects, Scenes, Activities, Object classification and detection: a part-based discriminative model (Latent SVM), Objects in Scenes. Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo;

3D vision and motion : Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture

### **Textbooks:**

1) Computer Vision: A Modern Approach, D. Forsyth and J. Ponce, Prentice Hall, 2nd ed., 2015, 2nd Edition.

2) Prince, Simon JD. Computer vision: models, learning, and inference. Cambridge University Press, 2012, 1st Edition. References: 4) Computer Vision: Algorithms and Applications, by Richard Szeliski, 2011 Edition, Springer.

### **Reference Books:**

1. Computer Vision: Algorithms and Applications, by Richard Szeliski, 2011 Edition, Springer.
2. Introductory Techniques for 3D Computer Vision, Emanuele Trucco and Alessandro Verri, Prentice Hall.1998, 1<sup>st</sup> Edition.

# CLOUD COMPUTING

## (PEC-II)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	0	3

### Course Objectives:

1. To understand the concepts of virtualization and its benefits
2. To impart fundamental concepts in the area of cloud computing.
3. To impart knowledge in applications of cloud computing.
4. To understand various services in cloud applications
5. To know the architecture of disaster recovery and security of cloud

### Course Outcomes:

Student will be able to:

1. Compare and contrast different cloud architecture
2. Learn & Implement Virtualization
3. Analyze and design storage mechanisms
4. Apply security mechanism for the Cloud.
5. Understand Disaster recovery in Cloud

### Unit I:

**Introduction to Virtualization:** Objectives of virtualization, history of virtualization, benefits of virtualized technology, the virtual service desk, what can be virtualized, related forms of computing, cloud computing, software as a service – SaaS, grid computing, utility computing, virtualization processes.

**Virtualization Technologies-I:** Ubuntu (server edition), Altiris, Windows server, Software virtualization, VMware, Intel virtualization, Red Hat virtualization, Soft grid application, Linux virtualization, Desktop virtualization, Hardware virtualization, Resource virtualization, Processor virtualization, Application virtualization.

### Unit II:

**Virtualization Technologies-II:** Storage virtualization, Virtualization density, Para-virtualization, OS virtualization, Virtualization software, Data Storage virtualization, Intel virtualization technology, Thininstall virtualization suite, Net framework virtualization, Windows virtualization on Fedora, Storage virtualization technologies, Virtualization level, Security monitoring and virtualization, Oracle virtualization.

### **Unit III:**

**Virtualization and Storage Management:** The heart of cloud computing-virtualization, defining virtualization, why virtualize, what can be virtualized, where does virtualization happen, how does virtualization happen, on the road to storage virtualization, improving availability using virtualization, improving performance through virtualization, improving capacity through virtualization, business value for virtualization.

### **Unit IV:**

**Introduction to Cloud Computing:** Cloud Introduction and overview- Components, Infrastructure and Services, Why Use Cloud Computing, Benefits and Limitations, Cloud Application Architectures, Cloud Infrastructure Models, Cloud Computing Technology- Hardware & Software Infrastructure

**Cloud Computing Architecture:** Requirements, Introduction to Cloud Computing Architecture, various kinds of Cloud Computing Architecture, Grid Computing, Transactional Computing, On Demand Computing, and Distributed Computing.

### **Unit V:**

**Security:** Security issues in Cloud Computing - Data Security, Network Security, and Host Security

**Disaster Recovery:** Disaster Recovery Planning, Disasters in the Cloud, Disaster Management.

**Scaling a Cloud Infrastructure-** Capacity Planning, Cloud Scale.

**Case Studies:** Amazon S3, Google APP Engine, IBM Clouds, Oracle OBIEE

### **Text Books:**

1. Ivanka Menken, Gerard Blokdijk ,Cloud Computing Virtualization Specialist Complete Certification Kit - Study Guide Book, 2009.
2. George Reese, Cloud Application Architectures Building Applications and Infrastructure in the Cloud, O'Reilly Media Press, 2009.

### **Reference Books:**

1. Anthony T. Velte, Tobe J. Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Publication Person Education, 2009
2. Tom Clark, Storage Virtualization: Technologies for Simplifying Data Storage and Management, Addison-Wesley, 2005
3. Curtis Brian **J.S. Chee**, Cloud Computing Technologies and Strategies of the Ubiquitous Datacenter, 2010

# CRYPTOGRAPHY

(PEC-II)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	0	3

## Course Objectives

1. Summarize the concepts of cryptography and its applications.
2. Compare and analyze encryption Algorithms
3. Differentiate Authentication Functionalities of MAC and Hash
4. Analyze security aspects of various web Applications
5. Analyze different network protocols

## Course Outcomes

1. Outline fundamentals of cryptography and its applications.
2. Differentiate Symmetric and Asymmetric Algorithms
3. Compare MAC and Hash Authentication Algorithms
4. Classify different network protocols.
5. Analyze security aspects of various web Applications

### UNIT – I

**Security Concepts:** Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security **Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

### UNIT – II

**Symmetric key Ciphers:** Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

**Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

### UNIT – III

**Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm (SHA-512), **Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure



## **UNIT – IV**

**Transport-level Security:** Web security considerations, Secure Socket Layer and Transport Layer

Security, HTTPS, Secure Shell (SSH)

**Wireless Network Security:** Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

## **UNIT – V**

**E-Mail Security:** Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security

architecture, Authentication Header, Encapsulating security payload, combining security associations,

Internet Key Exchange

**Case Studies on Cryptography and security:** Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

### **TEXT BOOKS:**

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6<sup>th</sup> Edition
2. Cryptography and Network Security :AtulKahate, McGraw Hill, 3<sup>rd</sup> Edition

### **REFERENCE BOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1<sup>st</sup> Edition.
2. Cryptography and Network Security :ForouzanMukhopadhyay, McGraw Hill, 3<sup>rd</sup> Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, Cengage Learning
6. Network Security and Cryptography: Bernard Menezes, Cengage Learning

# DATABASE MANGEMENT SYSTEMS

(PEC-II)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	0	3

## Course Objectives :

1. To provide a sound introduction to Database management systems, Databases and its applications
2. To familiarize the participant to give a good formal foundation on the relational model of data
3. To present SQL and procedural interfaces to SQL comprehensively
4. To give an introduction to systematic database design approaches conceptual design, logical design ,schema refinement and physical design
5. To introduce the concepts of transactions and transaction are processing and the issues and techniques relating to concurrency and recovery manager
6. To give exposure to Big Data and its processing tools

## Course Outcomes :

### Student will be able to

1. Model Entity-Relationship Model for enterprise level databases
2. Develop the database and provide restricted access to different users of
3. database and formulate the Complex SQL queries
4. Analyze various Relational Formal Query Languages and various Normal
5. forms to carry out Schema refinement
6. Differentiate various schedules and concurrency control protocols
7. Identify the various recovery algorithms and importance of Big Data processing

## Unit -I:

**Introduction to Database System Concepts:** Database-System Applications, Purpose of Database Systems, View of Data, Database Language, Database Design, Database Architecture, Database Users and Administrators.

**Introduction to the Relation Models and Database Design using ER Model:** Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations Overview of the Design Process, The Entity-Relationship Model,

Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues, Extended E-R Features,

## **Unit -II:**

**Introduction to SQL:** Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions Nested Sub queries, Modification of the Database.

**Intermediate and Advanced SQL:** Join Expressions, Views , Integrity Constraints, SQL Data Types, Authorization. Functions and Procedures, Triggers

## **Unit -III:**

**Formal Relational Query Languages:** The Relational Algebra, Tuple Relational Calculus, The Domain Relational Calculus.

**Relational Database Design:** Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Decomposition Using Multi valued Dependencies, More Normal Forms.

## **Unit -IV:**

**Transactions:** Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels.

**Concurrency Control:** Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols

## **Unit -V:**

**.Recovery System:** Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, ARIES, Remote Backup Systems.

**Introduction to BigData**

Introduction to Big Data, Characteristics of Big Data, Traits of Big data, Challenges of Conventional Systems, Sources of Big Data, Evolution Of Analytic Scalability, Analytic Processes and Tools, Analysis vs Reporting, Modern Data Analytic Tools

**Text Books:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Sixth Edition, Tata Mc Graw-Hill 2006.
2. Bill Franks, "Taming the Big data tidal wave", SAS, Wiley, 2012

**Reference Books:**

1. Raghu Rama Kirshna, Johannes Gchrke, Database Management System Third Edition, TATA MC Graw Hill, 2003
2. Peter Rob & Carlos Coronel, Data base Systems design, Implementation and Management, 7th Edition, 2007.
3. RamezElmasri, Shamkanth B. Navrate, Fundamentals of Database Systems, Pearson Education, 2008.
4. C.J. Date, Introduction to Database Systems, Pearson Education

# COMPUTER NETWORKS

(PEC-II)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	0	3

## Course Objectives:

1. Understand OSI & TCP/IP models and Data link layer
2. know the various Different routing protocols.
3. Exposure to TCP and UDP Protocols
4. Learn the concepts of IEEE 802.x standards
5. Understand the security aspects of networks

## Course Outcomes:

1. Identify the TCP/IP, OSI models and functionalities of Data Link Layer
2. Explain the various protocols of Network Layer
3. Differentiate the connection oriented and connection less protocols
4. Illustrate the various IEEE 802.11 standards and traffic engineering
5. Use various networking standards and security protocols

## UNIT-1

**Network Models**-Layered Tasks, OSI model, Layers in the OSI model, TCP/IP protocol Suite, Addressing, Basics of switching. Data Link Layer: Error detection and Correction- CRC, Checksum. Data Link Control- Framing, Flow and Error Control. Wired LAN: Ethernet, Protocols, Noiseless Channels, Noisy Channels, HDLC. Multiple Access - Random Access, Controlled Access, Channelization.

## UNIT-2

Network Address Translator, Internet Control Message Protocol, SNMP, CIDR, IPv6, Routing Protocol Basics in advanced networks, Routing Information Protocol (RIP), Interior Gateway Routing Protocol (IGRP), Switching Services, Spanning Tree Protocol (STP), Standard Network Management Protocol.

### **UNIT-3**

TCP and Mobile TCP, TCP Tahoe and TCP Reno, High speed TCP, Coexistence of UDP and TCP flows, HTTP and HTTPS, FTP and SFTP, Domain Name Service, TCP and UDP sockets

### **UNIT-4**

Introduction to traffic Engineering, Requirement Definition for Traffic Engineering, Traffic Sizing, Traffic Characteristics, Delay Analysis, Connectivity and Availability, Introduction to Multimedia Services, Explaining Transmission of Multimedia over the Internet. Introduction to Wireless Links and Network Characteristics, CDMA, WiFi: 802.11, Wireless LANs, The 802.11 Architecture, The 802.11 MAC Protocol, The IEEE 802.11 Frame, Mobility in the Same IP Subnet, Advanced Features in 802.11, Personal Area Networks: Bluetooth and Zigbee, Cellular Internet Access, An Overview of Cellular Network Architecture.

### **UNIT-5**

Explaining IP Multi casting, VOIP, Unified Communication, Virtual Networking, Data center Networking, Introduction to Optical Networking, SONET /SDH Standard, Next generation cellular networks, Secure Socket Layer, IP Sec, TLS, Kerberos, Domain name system Protection.

### **TEXT BOOKS:**

1. Andrew S. Tanenbaum, Computer Networks, Third Edition.
2. Computer Networking: A Top-Down Approach, 6/e, James F. Kurose and Keith W. Ross, Pearson Education, 2012.
3. Larry L. Peterson and Bruce S. Davie, Computer Networks: A systems approach, Morgan Kaufman, 5th Edition, 2012

### **REFERENCE BOOKS:**

1. Advance Computer Network, By Dayanand Ambawade, Dr. Deven shah, Prof. Mahendra Mehra, Wiley India
2. CCNA Intro – Study Guide – Todd Lammle, Sybex
3. Computer Networks by Mayank Dave, Cengage.
4. Guide to Networking Essentials, *Greg Tomsho, Ed Tittel, David Johnson*, Fifth Edition, Thomson.
5. Computer Networks, *Andrew S. Tanenbaum*, Fourth Edition, Prentice Hall.

6. An Engineering Approach to Computer Networking, *S. Keshav*, Pearson Education.
7. Campus Network Design Fundamentals, *Diane Teare, Catherine Paquet*, Pearson Education (CISCO Press)
8. Computer Communications Networks, Mir, Pearson Education.
9. Chwan-Hwa (John) Wu, J. David Irwin, Introduction to computer networks and Cyber Security, CRC press, Taylor & Francis Group, 2014
10. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Pearson, 5<sup>th</sup> Edition, 2014

# ENTRPERNEURSHIP DEVELOPMENT

(OE-I)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	0	3

## Course Objectives:

1. To provide insights into basic characteristics and process of entrepreneurship
2. To develop a business idea and prepare a bankable project report
3. To identify the methods to initiate ventures and the sources of finance
4. To create awareness about the legal challenges of entrepreneurship and IPR
5. To know and apply the various strategic and managerial concerns in the growth stage of the firms

**Course Outcomes:** At the end of the course, students will be able to

1. Interpret concepts and process of entrepreneurship.
2. Apply idea development strategies and prepare a bankable project report
3. Analyse various opportunities towards initiating ventures.
4. Recognize legal challenges of entrepreneurship.
5. Assess the strategic perspectives of entrepreneurship.

## Unit- I

**Introduction:** Introduction to Entrepreneurship – Characteristics, Qualities, Key Elements and Skills of an Entrepreneur, entrepreneurial stress, Corporate entrepreneurship, Entrepreneurial process.

## Unit -II

**Business Plan Preparation:** Search for business idea, project identification, project formulation and development, contents of business plan and Preparation of a Bankable Project Report.

## Unit- III

**Launching Entrepreneurial Venture:** Opportunities identification, Methods to initiate Ventures, Creating new ventures, Acquiring existing ventures, Franchising. Sources of finance, Forms of capital requirements, funding agencies and supporting institutions.

## Unit- IV:

**Legal challenges of Entrepreneurship:** Intellectual Property Protection – Patents, Copyrights, Trademarks and Trade Secrets. The challenges of new Venture Startups- Poor financial



understanding, critical factors for new venture development, Evaluation process, Feasibility criteria approach.

**Unit -V:**

**Strategic perspectives in Entrepreneurship:**Strategic planning- Strategic Action, Strategic Positioning, Business Stabilization, Building the adaptive firms, understanding the growth stage, unique managerial concern of growing ventures.

**Text Book:**

1. D F Kuratko and T V Rao “Entrepreneurship- A South-Asian Perspective “Cengage Learning, 2012
2. Vasant Desai, Small Scale Industries and Entrepreneurship, HPH, 2012.

**References:**

1. Rajeev Roy, Entrepreneurship, 2e, Oxford, 2012.
2. B.Janakiram and M.Rizwana, Entrepreneurship Development:Text& Cases, Excel Books, 2011.
2. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
3. Robert Hisrich et al, Entrepreneurship, 6e, TMH, 2012.
4. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013
5. Shejwalkar, Entrepreneurship Development, Everest, 2011
6. Khanka, Entrepreneurship Development, S.Chand, 2012

# PROJECT MANAGEMENT

(OE-I)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	0	3

## Course Objectives:

1. To understand the concept of Project Management.
2. To know about the different approaches to project screening and planning.
3. To explain about the factors of risk involved in project execution.
4. To understand about team leading and functional cooperation.
5. To know about the project performance and future trends in the project management.

**Course Outcomes:** At the end of the course students will be able to

1. Explain about the life cycle and other concepts of Project Management.
2. Apply different approaches to project screening and planning
3. Analyze different risk factors in project execution
4. Estimate how to lead a team, to get functional cooperation
5. Build performance evaluation reports and future trends in project management.

## Unit-I

**Introduction:** Meaning, Need, Principles Project Lifecycle and its Phases, Project Management Research in brief, Project Management today, Organization strategy and structure and culture, Format of organization structure, Stake holder Management, Organization Culture, creating a culture for Project Management.

## Unit-II

**Project Identification and Planning:** Defining the project, Project Identification Process, Approaches to Project Screening and Selection, Project Planning, Work Breakdown Structure, Financial Module, Getting Approval and Compiling a Project Charter, setting up a Monitoring and Controlling Process.

## Unit-III

**Project Execution:** Initiating the Project, Controlling and Reporting Project Objectives, Conducting project evaluation, Risk, Risk Management Factors, Project Management, Four

Stage Process, Risk Management an Integrated Approach, Cost Management, Creating a Project Budget.

#### **Unit-IV**

**Leading Project Teams:** Building a Project Team, Characteristics of an effective Project Team, achieving Cross- Functional Co-operation, Virtual Project Teams, Conflicts Management, Negotiations.

#### **Unit-V**

**Performance Measurement and Evaluation:** Monitoring Project Performances, Project Control Cycles, Earned Value Management, Human factors in Project Evaluation and Control, Project Termination, Types of Project Terminations, Project Follow-up. Current and Future Trends in Project Management.

#### **TEXT BOOKS:**

1. Gray, Larson, Project Management, Tata McGraw Hill, 2015
2. Jeffery K. Pinto, Project Management, Pearson Education, 2015

#### **REFERENCES**

1. Enzo Frigenti, Project Management, Kogan, 2015
2. R. Panneerselvam & P. Senthil Kumar, Project Management, PHI, 2015
3. Thomas M. Cappels, Financially Focused Project Management, SPD, 2008.

# PRINCIPLES OF COMPUTER COMMUNICATIONS AND NETWORKS

(OE-I)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
3	0	3

## UNIT - I

**Overview of Computer Communications and Networking:** Introduction to Computer Communications and Networking, Introduction to Computer Network, Types of Computer Networks, Network Addressing, Routing, Reliability, Interoperability and Security, Network Standards, The Telephone System and Data Communications.

## UNIT - II

**Essential Terms and Concepts:** Computer Applications and application protocols, Computer Communications and Networking models, Communication Service Methods and data transmission modes, analog and Digital Communications, Speed and capacity of a Communication Channel, Multiplexing and switching, Network architecture and the OSI reference model.

## UNIT - III

**Analog and Digital Communication Concepts:** Representing data as analog signals, representing data as digital signals, data rate and bandwidth reduction, Digital Carrier Systems.

## UNIT - IV

**Physical and data link layer Concepts:** The Physical and Electrical Characteristics of wire, Copper media, fiber optic media, wireless Communications. Introduction to data link Layer, the logical link control and medium access control sub-layers.

## UNIT - V

**Network Hardware Components:** Introduction to Connectors, Transreceivers and media convertors, repeaters, network interference cards and PC cards, bridges, switches, switches Vs Routers.

### TEXT BOOKS:

1. Computer Communications and Networking Technologies, Michel A. Gallo and William H. Hancock, Thomson Brooks / Cole.

### REFERENCE BOOKS:

1. Principles of Computer Networks and Communications, M. Barry Dumas, Morris Schwartz, Pearson.

## ADVANCED ALGORITHMS LAB

(PCC-LAB)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
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1. Write Java programs that use both recursive and non-recursive functions for implementing the following searching methods:

- a) Linear search
- b) Binary search

2. Write Java programs to implement the following using arrays and linked lists

- a) List ADT

3. Write Java programs to implement the following using an array.

- a) Stack ADT
- b) Queue ADT

4. Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT).

5. Write a Java program to implement circular queue ADT using an array.

6. Write Java programs to implement the following using a singly linked list.

- a) Stack ADT
- b) Queue ADT

7. Write Java programs to implement the deque (double ended queue) ADT using

- a) Array
- b) Singly linked list
- c) Doubly linked list.

8. Write a Java program to implement priority queue ADT.

9. Write a Java program to perform the following operations:

a) Construct a binary search tree of elements.

b) Search for a key element in the above binary search tree.

c) Delete an element from the above binary search tree.

10. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.

11. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.

12. Write Java programs for the implementation of bfs and dfs for a given graph.

13. Write Java programs for implementing the following sorting methods:

a) Bubble sort                      d) Merge sort g) Binary tree sort

b) Insertion sort                      e) Heap sort

c) Quick sort                      f) Radix sort

14. Write a Java program to perform the following operations: a) Insertion into a B-tree b) Searching in a B-tree

15. Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.

16. Write a Java program that implements KMP algorithm for pattern matching.

**(Note: Use packages like java.io, java.util, etc)**

**MACHINE LEARNING LAB**  
**(PEC-I LAB)**

I Year M.Tech. CSE - I Sem

L	T / P / D	C
0	6	3

- 1) Credit risk analysis using decision tree classifier
- 2) Predicting of Cardiovascular Risk classification
  - Linear regression
  - Logistic regression
  - Decision tree classifiers
  - Random forest
- 3) Covid data analysis  
Using following models
  - Linear regression
  - Logistic regression
  - Decision tree classifiers
  - Random forest
- 4) Face Recognition using multi-layer perceptron
- 5) Planar data classification with a hidden layers of ANN
- 6) Classifying text documents using **Bayesian theorem**
- 7) Create a model for any binary classification with Instance Based Learning using k-Nearest Neighbor algorithm
- 8) Create a model multi label classification with Instance Based Learning using– Radial Basis Functions
- 9) Create a model for any binary classification with Instance Based Learning using Case Based Learning
- 10) Classifying Web Pages using First Order Rule
- 11) Design a model for stock market data analysis using Analytical Learning
- 12) Design a model for stock market data analysis using Reinforcement Learning

**Data Science and Analytics lab**  
**(PEC-I LAB)**

I Year M.Tech. CSE - I Sem

L	T / P / D	C
0	6	3

**Course outcomes**

1. Understand data science concepts and various use cases in different industries.
2. Solve real-world problems with data science.
3. Use statistics and probability for data science.
4. Create powerful business dashboards with Tableau

**Prerequisites:**

1. Basics of Python Programming
2. Basics of R programming
3. Statistics and probability

**Programming Languages/Tools:**

R, Tableau, Python

**List of Experiments:**

**Data Science with using Python and R**

- Installation of Libraries

**Python:**

- Accessing and importing and exporting data
- Data manipulation and data cleaning

**Machine Learning using Python:**

- Linear regression
- Logistic Regression

**Introduction to R tool for data analytics science**

- Statistics analysis and Visualization in R
- EDA Using R
- K-means Clustering (supervised Learning)
- K-NN (Unsupervised learning)



## **Data Visualization using Tableau**

- Installation of Tableau
- Introduction to Tableau interface
- Connecting to data
- Visual analytics
- Mapping
- Creating Dash Boards and stories

# INTERNET OF THINGS LAB

(PEC-I LAB)

I Year M.Tech. CSE - I Sem

L	T / P / D	C
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## List of Experiments:

1. Study and Install Arduino IDE.
2. Write a Program using Arduino IDE for buzzer.
3. Write a program using Arduino IDE for Blink LED.
4. Write a Program for RGB LED using Arduino.
5. Write a Program for monitor temperature using Arduino.
6. Write a Program for LDR sensor using Arduino.
7. Write a Program for Ultrasonic Sensor using Arduino.
8. Write a Program for IR Sensor using Arduino.
9. Study and Configure Raspberry Pi.
10. Study and Install Raspbian Operating System on Raspberry Pi.
11. Write a Python Program for LED blink using Raspberry Pi.
12. Write a Python Program for RGB LED using Raspberry Pi
13. Write a Python Program for monitor temperature using Raspberry Pi.
14. Write a Python Program for LDR sensor using Raspberry Pi.
15. Write a Python Program for Ultrasonic Sensor using Raspberry Pi.
16. Write a Python Program for IR Sensor using Raspberry Pi.

## **COMPUTER VISION LAB (PEC-I LAB)**

I Year M.Tech. CSE - I Sem

L	T / P / D	C
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### **Course Outcomes**

1. Understand basic operations on Image for different applications
2. Investigate the Image Shape analysis for deriving features from an image
3. Generate 3D model from images for more precise results for applications
4. Identify the applications using computer vision techniques
5. Understand video processing, motion computation and geometry

### **List of programs:**

1. Write an application for Implement image geometrical operations
2. Write an application for Implementation of Edge detection operators
3. Write an application for Implementing image Projection
4. Implement Segmentation methods like Histogram Thresholding Segmentation
5. Construct 3D model from images
6. Construct 3D model from Stereo pair
7. Application for deriving SIFT,HOG and SURF features
8. Write an application for Face detection and Recognition
9. Write an application for Object detection from dynamic Background.
10. Implement Principal component analysis for dimensionality reduction
11. Write an application for foreground – background separation
12. Write an application for Content based image retrieval

### **List of Open Source Software/learning website:**

1. Computer Vision. Ballard and Brown
2. Invitation to 3D Vision: From Images to Geometric Models: Y. Ma, S. Soatto, J. Kosecka and S. Sastry

## **M.Tech I Year II Sem**

I Year M.Tech. CSE - II Sem

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### **INFORMATION SECURITY**

**(PCC)**

#### **Course Objectives**

1. Compare and analyze encryption Algorithms
2. Summarize Authentication Functions using MAC and Hash
3. Analyze security importance of various web Applications
4. Categorize various types of Intruders and Viruses

#### **Course Outcomes:**

Students will be able to:

1. Analyze the importance of information Security in real world
2. Compare various encryption Algorithms.
3. Summarize authentication functions using MAC and Hash
4. Outline security importance of various web applications.
5. Categorize various types of intruders and viruses.

#### **Unit I:**

Information Security: Introduction, History of Information security, What is Security, CNSS Security Model, Components of Information System, Balancing Information Security and Access, Approaches to Information Security Implementation, The Security Systems Development Life Cycle.

#### **Unit II :**

Cryptography: Concepts and Techniques, symmetric and asymmetric key cryptography, steganography, Symmetric key Ciphers: DES structure, DES Analysis, Security of DES, variants of DES, Block cipher modes of operation , AES structure, Analysis of AES , Key distribution Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Analysis of RSA, Diffie-Hellman Key exchange.

### **Unit III:**

Message Authentication and Hash Functions: Authentication requirements and functions, MAC and Hash Functions, MAC Algorithms: Secure Hash Algorithm, Whirlpool, HMAC, Digital signatures, X.509, Kerberos.

### **Unit IV**

Security at layers (Network, Transport, Application): IPSec, Secure Socket Layer(SSL), Transport Layer Security(TLS), Secure Electronic Transaction(SET), Pretty Good Privacy(PGP), S/MIME.

### **Unit V**

Intruders, Virus and Firewalls: Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls.

### **Text Books:**

1. Michael E. Whitman, Herbert J. Mattord, Principles of Information Security, CENGAGE Learning, 4th Edition.
2. William Stallings, Cryptography and Network Security, Pearson Education, 4th Edition

### **Reference Books:**

1. C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network Security : Wiley India, 1st Edition.
2. Bernard Menezes, Network Security and Cryptography: CENGAGE Learning
3. AtulKahate, Cryptography and Network Security: McGraw Hill, 2nd Edition
4. <http://williamstallings.com/Extras/Security -Notes/>

I Year M.Tech. CSE - II Sem

L T/P/D C

3 1 4

## **SOFTWARE ENGINEERING**

**(PCC)**

### **Course objectives**

1. To define software engineering and explain its Significance in Software Development
2. To discuss the concepts of software products and software processes
3. To introduce Software design techniques for a given scenario
4. To Design and apply various testing techniques for given project .
5. To explain the importance of process visibility.

### **Course Outcomes:**

Student will be able to:

1. Choose a process model to apply for given project requirements.
2. Identify various requirement and system model for a given project.
3. Design and plan software solutions to problems using an object-oriented strategy
4. Design and apply various testing techniques.
5. Understand metrics for Process and Products.

### **UNIT-I:**

**Introduction to Software Engineering:** The evolving role of software, changing nature of software, software myths.

**A Generic view of process:** Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models.

**Process models:** The waterfall model, incremental process models, evolutionary process models, the unified process.

## **UNIT-II:**

**Software Requirements:** Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.

**Requirements engineering process:** Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

**System models:** Context models, behavioral models, data models, object models, structured methods.

## **UNIT-III:**

**Design Engineering:** Design process and design quality, design concepts, the design model. **Creating an architectural design:** software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modelling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

**Activity Planning:** Objectives, plan, project schedules, project activities, network planning models, formulating the network models, forward pass and backward pass, identifying the critical path

## **UNIT-IV:**

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. **Product metrics:** Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

## **UNIT-V:**

**Metrics for Process and Products:** Software measurement, metrics for software quality.

**Risk management:** Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

**Quality Management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

### **TEXT BOOKS:**

1. Software Engineering, A practitioner's Approach - Roger S. Pressman, 6<sup>th</sup> edition, Mc Graw Hill International Edition.
2. Software Engineering- Sommerville, 7<sup>th</sup> edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

### **REFERENCES:**

1. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
2. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.
3. Fundamentals of object oriented design using UML Meiler page-Jones: Pearson Education.
4. <https://www.educba.com/software-development>

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## **DEEP LEARNING**

**(PEC – III)**

### **Course Objectives:**

1. To Give an exposure to Supervised Deep Learning for working with Linearly Non Separable Data
2. To provide understanding of Mathematical, Statistical and Computational challenges of building stable representations. .
3. To Know the application of Convolution Neural Networks for High-Dimensional data, such as image and other data types
4. To Explore Deep Recurrent and Memory Networks for Sentiment Analysis, Machine Translation and Computer Vision tasks
5. To have an understanding of Unsupervised Deep Learning.



**Course outcomes:**

Students will be able to

1. Explain the concept behind the Deep Neural Networks for Learning Non-linear Functions
2. Use the hyper tuning methods to improve the performance of Deep Neural Networks
3. Apply the concepts of the Deep Convolution Neural networks for Image classification
4. Solve the problems related to Deep Recurrent Neural Networks and Memory Networks for Sentimental Analysis
5. Identify the concepts of Unsupervised Deep Learning for Data Reduction

**UNIT I :**

Introduction: History, AI vs ML vs DL, Deep Learning and its Applications ,Feed forward Neural networks, Gradient descent and the Backpropagation Algorithm,

**UNIT II:**

Unit saturation, aka the vanishing gradient problem, and ways to mitigate it, Heuristics for avoiding bad local minima, Heuristics for faster training, Nestors accelerated gradient descent, Regularization, Dropout.

**UNIT III:**

Convolutional Neural Networks: Convolution, Striding, Padding, Pooling, Modern CNN models; CNN Visualizations, CNN Applications: Transfer Learning, Image classification

**UNIT IV:**

Recurrent Neural Networks: Introduction, Time-series data analysis, Forward Propagation, Backpropagation Through Time (BPTT), Word embedding, Vanishing-exploding gradients, LSTM, GRU, RNN Application: Sentiment Analysis, Text generation, Image Captioning, Machine Translation, Attention Models for Computer Vision tasks.

**UNIT V**

Deep Unsupervised Learning Auto encoders -standard, sparse, denoising, contractive, Variational Autoencoders, Adversarial Generative Networks, Autoencoder and DBM.

**Textbooks:**

- 1) Ian Goodfellow, YoshuaBengio and Aaron Courville, Deep Learning (1<sup>st</sup> Edition), MIT Press,2017, ISBN 978-0262035613.
- 2) Bharath Ramsundar& Reza Bosagh Zadeh, Tensor Flow for Deep Learning, O'Reilly Media ,2018

**References:**

- 1) Francois Chollet, Deep Learning with Python (1<sup>st</sup> Edition), Manning Publications Company, 2017. ISBN 978-1617294433.
- 2) AurélienGéron, Hands-on Machine Learning with Scikit-Learn and TensorFlow (2<sup>nd</sup> Edition), O'Reilly Media, 2019. ISBN 978-9352139057.
- 3) <http://www.deeplearningbook.org/>

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**BLOCK CHAIN TECHNOLOGY**

**(PEC – III)**

**Course Objectives:**

1. Identify different components and types of Blockchain.
2. Apply Ethereum tool for application development
3. Interpret various components of DApps and multichain
4. Summarize the architecture of Hyperledger Fabric
5. Analyse the impact of Blockchain in business

**Course Outcome:**

1. Summarize types and applications of Blockchain
2. Illustrate the design and deployment of smart contract through Ethereum
3. Apply DApps through Truffle IDE
4. Apply Hyper Ledger Fabric model in different Networks
5. Categorize different Business Applications of Blockchain

**UNIT I:**

**What is Blockchain:** Definition, history, Digital Money to Distributed Ledgers

**Why Blockchain:** Properties of Blockchain, Requirements for the consensus protocols, Proof of Work (PoW), PoS, Zero Knowledge Proofs, Byzantine Models, hashing, Merkle Tree,

**Types of Blockchain:** Generations of Blockchain - First, second, third

**Application Areas:** Banking and Financial Institutions, Supply chain management, real estate, healthcare, Government sectors

**UNIT II:**

**Ethereum Solidity:** Introduction, Datatype, operator, enum, arrays, loops, Mapping, Structure, State Modifiers, Exception Handling in Solidity, Inheritance, Events, Self Destruction, ERC Tokens, Constructors, Libraries, Compile and Deploy the Smart Contract

**UNIT III:**

**Truffle IDE:** creating user interface, textboxes, radio buttons, drop down list, buttons, Developing a DApp, Publish the DApp Connecting to DApp, truffle migrate, truffle test.

**Multichain:** What Is chain code(go) and MultiChain? Privacy and Permissions in MultiChain Mining in MultiChain Multiple configurable Blockchains using MultiChain Setting up a Private Blockchain, Blockchain Bytes

#### **UNIT IV:**

**Hyperledger(go Lang):** Introduction, architecture, Consensus, API, frameworks, Setting up Development Environment using Composer, Developing and Testing business networks, Hyperledger Fabric Model Various ways to create Hyperledger Fabric Blockchain Network

#### **UNIT V:**

Blockchain transforming business, How governments around the world are using Blockchain?, Real time scenarios of Blockchain (Supply chain management, real estate, healthcare, Government sectors , bitcoin, Libra etc.)

#### **Text Books:**

1. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017
2. Hyperledger Fabric - <https://www.hyperledger.org/projects/fabric>
3. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits - <https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html>

#### **Reference Books**

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas Antonopoulos Blockchain by Melanie Swa, O’Reilly
2. Philipp Hacker, IoannisLianos (2019). **Regulating Blockchain: Techno-Social and Legal Challenges**, OUP Oxford. (ISBN-13: 978-0198842187).
3. <http://ethdocs.org/en/latest/>

## **NATURAL LANGUAGE PROCESSING**

### **(PEC- III)**

**Pre-requisites: Artificial Intelligence, Machine Learning, Python Programming**

#### **Course Objectives:**

1. To learn the fundamentals of Natural Language Processing
2. To understand the use of CFG and PCFG in NLP
3. To understand the role of semantics of sentences and pragmatics
4. To apply the NLP techniques to IR applications

#### **Course outcomes:**

Students will able to

1. To apply the techniques for word level analysis (L3)
2. To model the language using N-grams (L3)
3. To implement a shallow processing models to tackle morphology/syntax of a language (L3)
4. To Examine Syntagmatic and Paradigmatic relations be used for processing the real-time applications (L4)
5. To apply the algorithms for Discourse Analysis (L3)

#### **UNIT I: INTRODUCTION**

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Text Normalization, Minimum Edit Distance, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors

#### **UNIT II :WORD LEVEL ANALYSIS**

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

### **UNIT III :SYNTACTIC ANALYSIS**

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

### **UNIT IV: SEMANTICS AND PRAGMATICS**

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

### **UNIT V :DISCOURSE ANALYSIS AND LEXICAL RESOURCES**

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

#### **Text Books:**

1. Daniel Jurafsky, James H. Martin ,”Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech”, Pearson Publication, 2014.
2. Deepti Chopra, Nisheeth Joshi, Iti Mathur “Mastering Natural Language Processing with Python” First Edition, Packt Publishing, 2016

#### **Reference Books:**

1. James Allen, “Natural Language Understanding”, 2nd Edition, Benjamin, Cummings publishing company, 1995.
2. Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python” , First Edition, OReilly Media, 2009

3. Rajesh Arumugam, RajalingappaaShanmugamani, “Hands-On Natural Language Processing with Python” ,Packt Publishing Ltd., 2018
4. <http://www.pdfdrive.com/natural-language-processing-with-python-e1251452.html>
5. <https://learning.oreilly.com/library/view/hands-on-natural-language/9781789139495>

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## **BIG DATA**

### **(PEC – III)**

#### **Course Objectives:**

1. To understand the performance management this interprets the meaning of big data in company databases using pre-determined queries and multidimensional analysis.
2. To understand the Data exploration i.e. makes heavy use of statistics to experiment and get answers to questions those managers might not have thought of previously.
3. To understand the social analytics measure the vast amount of non-transactional data that exists today.
4. To understand the decision science which involves experiments and big data analysis

#### **Course Outcomes:**

1. Intepretthe sources of BigData and Analyzing Tools.
1. Map statistical methods to analyze huge data.
2. Discover the other frameworks in Distributed File Systems.
3. Apply cluster in Hadoop distributed file system.
4. Apply Map Reduction in HDFS.

#### **UNIT – I**

Big Data What is big data, History of Data Management; Structuring Big Data; Elements of Big Data; Big Data Analytics; Distributed and Parallel Computing for Big Data; Big Data Analytics: What is Big Data Analytics, What Big Data Analytics Isn't, Why this sudden Hype Around Big Data Analytics, Classification of Analytics, Greatest Challenges that Prevent Business from

Capitalizing Big Data; Top Challenges Facing Big Data; Why Big Data Analytics Important; Data Science; Data Scientist; Terminologies used in Big Data Environments; Basically Available Soft State Eventual Consistency (BASE); Open source Analytics Tools;

## **UNIT – II**

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics; Points to Consider during Analysis; Developing an Analytic Team; Understanding Text Analytics; Analytical Approach and Tools to Analyze Data: Analytical Approaches; History of Analytical Tools; Introducing Popular Analytical Tools; Comparing Various Analytical Tools.

## **UNIT - III**

Understanding MapReduce Fundamentals and HBase : The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop : Introduction of HDFS, Architecture, HDFS Files, File system types, commands, org.apache.hadoop.io package, HDFS High Availability; Introducing HBase, Architecture, Storing Big Data with HBase , Interacting with the Hadoop Ecosystem; HBase in Operations Programming with HBase; Installation, Combining HBase and HDFS;

## **UNIT - IV**

Big Data Technology Landscape and Hadoop : NoSQL, Hadoop; RDBMS versus Hadoop; Distributed Computing Challenges; History of Hadoop; Hadoop Overview; Use Case of Hadoop; Hadoop Distributors; HDFS (Hadoop Distributed File System), HDFS Daemons, read,write, Replica Processing of Data with Hadoop; Managing Resources and Applications with Hadoop YARN.

## **UNIT - V**

Social Media Analytics and Text Mining: Introducing Social Media; Key elements of Social Media; Text mining; Understanding Text Mining Process; Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets; Mobile Analytics: Introducing Mobile Analytics; Define Mobile Analytics; Mobile Analytics and Web Analytics; Types of Results from Mobile Analytics; Types of Applications for Mobile Analytics; Introducing Mobile Analytics Tools;

## **TEXT BOOKS:**

1. BIG DATA and ANALYTICS, Seema Acharya, SubhasininChellappan, Wiley publications.
2. BIG DATA, Black Book™, DreamTech Press, 2015 Edition.
3. BUSINESS ANALYTICS 5e , BY Albright |Winston

## **REFERENCE BOOKS:**



1. Rajiv Sabherwal, Irma Becerra- Fernandez,” Business Intelligence –Practice, Technologies and Management”, John Wiley 2011.
2. Lariss T. Moss,ShakuAtre, “ Business Intelligence Roadmap”, Addison-Wesley It Service.
3. YuliVasiliev, “ Oracle Business Intelligence : The Condensed Guide to Analysis and Reporting”, SPD Shroff, 2012.

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## **INTELLECTUAL PROPERTY RIGHTS**

**(OE-II)**

### **Course Objectives:**

1. To understand the concepts of Intellectual Property Rights and related agencies.
2. To know about the purpose and functions of Trademarks in competitive environment
3. To explain the process of Patent and Copyrights and related procedures
4. To know the Trade Secret Law and its protection from Unfair practices.
5. To get knowledge on the overview of International Intellectual Property Scenario.

**Course Outcomes:** After completing this course the student will be able to

6. Explain the concepts of Intellectual Property Rights and related agencies.
7. Describe the purpose and functions of Trademarks in Competitive Environment
8. Analyze the process of Patent and Copyrights and related procedures
9. Explore the Trade secret law and its protection from Unfair practices
10. Explain the overview of International Intellectual Property Scenario

### **Unit- I**

**Introduction to Intellectual Property:** Introduction, Types of Intellectual Property, International Organization, Agencies and Treaties, Importance of Intellectual Property Rights.

### **Unit-II**

**Trademarks:** Purpose and Function of Trademarks, Acquisition of Trademarks Rights, Protectable Matter, Selecting and Evaluating Trade Mark, Trade Mark Registration Processes.

### **Unit-III**

**Law Of Copy Rights&Patents:** Fundamental of Copy Rights Law, Originality of Material, Rights of Reproduction, Rights to Perform the Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice of Copy Right, International Copy Right law. Foundation of Patent Law, Patent Searching Process, Ownership Rights & Transfer.

### **Unit-IV**

**Trade Secrets&Unfair Competition:** Trade Secret Law, Determination of Trade Secret Status, Liability for Misappropriation Right of Trade Secrets, Protection for Submission, Trade Secret Litigation. Misappropriation Right of Publicity, False Advertising.

### **Unit- V**

**New Development&International Overview OnIntellectual Property:** New Developments in Trade Mark Law, Copy Right Law, Patent Law, and Intellectual Property Audits. International Trade Mark Law, Copy Right Law, International Patent Law, International Development in Trade Secrets Law.

### **TEXT BOOKS:**

1. Deborah. E. Bouchoux, Intellectual Property Rights, Cengage learning
2. PrabuddhaGangulli, Intellectual Property Rights Unleashing the knowledge economy, Tata Mc Graw Hill Publishing Company Ltd.

### **REFERENCES:**

1. Khushdeep Dharni and Neeraj Pandey, Intellectual Property Rights, PHI Learning Pvt. Ltd.
2. Vivien Irish, Intellectual Property Rights for Engineers, 2nd edn, IET, 2005
3. Carlos Alberto Primo Braga, Carsten Fink, Claudia Paz Sepulveda, Intellectual Property Rights and Economic Development, World Bank Publications, 2000

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## **VALUE ENGINEERING**

### **(OE-II)**

#### **Course Objectives**

1. To understand the concept of value engineering in productivity
2. To understand the different phases of value engineering projects

3. To learn the various decision alternatives
4. To learn value engineering in non-hardware projects
5. To identify the value engineering team and coordinate in different services

### **Course Outcomes**

At the end of the course the student will be able to

1. Apply the importance of value engineering concepts in productivity
2. Analyze the different phases of value engineering projects
3. Evaluate the different decision alternatives and choose the best alternative for optimization
4. Determine the value engineering concept in non-hardware projects and programmes
5. Analyze the value engineering teams with the help of case study.

### **Unit-I**

**Introduction:** Value engineering concepts, advantages, applications, problem recognition, and role in productivity, criteria for comparison, element of choice. Level of value engineering in the organization, unique and quantitative evaluation of ideas.

### **Unit-II**

**Value Engineering and Job Plan:** Introduction, orientation, information phase, speculation phase analysis phase. Selection and Evaluation of value engineering projects, Project selection, methods selection, value standards, application of value engineering methodology

### **Unit-III**

**Value Engineering Techniques:** Selecting Products and Operation for Value Engineering action, Value Engineering Programmes, Decision Making for Optimum Alternative, Use of Decision Matrix, Make or Buy, Measuring Profits, Reporting Results, Follow up, Use of advanced technique like Function Analysis System.

### **Unit-IV**

**Versatility Of Value Engineering:** Value engineering operation in maintenance and repair activities, Value Engineering in non-Hardware Projects. Initiating a Value Engineering Programme

### **Unit-V**

**Value Engineering Level of Effort:** Value Engineering Team, Co-coordinator, Designer, different Services, Construction Management Contracts, Value Engineering Case Studies.

**TEXT BOOKS:**

1. Anil Kumar Mukhopadhyaya, "Value Engineering: Concepts Techniques and applications", SAGE Publications 2010.
2. Del L. Younker, "Value Engineering analysis and methodology", Marcel Dekker Inc, New York, 2004

**REFERENCES:**

1. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997
2. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999.
3. Miles, L.D., "Techniques of Value Analysis and Engineering", Second Edition, McGraw Hill 1989.
4. Khanna, O.P., "Industrial Engineering and Management", DhanpatRai& Sons, 1993.
5. Anil Kumar Mukhopadhyaya, "Value Engineering Mastermind: From concept to Value Engineering Certification", SAGE Publications, 2003

## **EMBEDDED SYSTEM DESIGN**

### **(OE-II)**

#### **UNIT -I**

**Introduction to Embedded Systems:** Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

#### **UNIT -II**

**Typical Embedded System:** Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

#### **UNIT -III**

**Embedded Firmware:** Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

#### **UNIT -IV**

**RTOS Based Embedded System Design:** Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

#### **UNIT -V**

**Task Communication:** Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

#### **TEXT BOOKS:**

1. Shibu K.V, "Introduction to Embedded Systems", McGraw Hill.

#### **REFERENCE BOOKS:**

1. Raj Kamal, "Embedded Systems", TMH.
2. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley.

3. Lyla, “Embedded Systems”, Pearson, 2013
4. David E. Simon, “An Embedded Software Primer”, Pearson Education.

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### **INFORMATION SECURITY LAB (PCC)**

1. Installation of NMAP.
2. Implement port scanning with NMAP
3. Perform the following using NMAP
  - a. .Find ports on a system
  - b. .Find active machines
  - c. .Find the version of remote OS.
  
4. Installation of Wireshark.
5. Perform an experiment to sniff for router traffic by using Wireshark.
6. Implement Simple Data Encryption Standard (SDDES) Algorithm through C program
7. Implement Diffie–Hellman key exchange algorithm through C program.
8. Installation of Jcrypt tool
9. Implement DES algorithm using Jcrypt tool
10. Implement RSA algorithm using Jcrypt tool
11. Implement HASH algorithm using Jcrypt tool
12. Implement SHA1 algorithm using Jcrpty tool
13. Implement brute force algorithm in C .

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### **SOFTWARE ENGINEERING LAB**

#### **(PCC LAB)**

- 1) Write down the problem statement and software Requirement Specification Sheet (SRS) for suggested system
- 2) To perform the user's view analysis for the suggested system: Use case and DFD diagram.
- 3) To draw the structural view diagram for the system: Class diagram, object diagram
- 4) To draw the behavioral view diagram : State-chart diagram, Activity diagram
- 5) To perform the behavioral view diagram for the suggested system : Sequence diagram, Collaboration diagram
- 6) To perform the implementation view diagram: Component diagram for the system.
- 7) To perform the environmental view diagram: Deployment diagram for the system.
- 8) To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system.
- 9) To Prepare time line chart/Gantt Chart/PERT Chart for selected software project



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**DEEP LEARNING LAB**  
**(PE-III LAB)**

1. Demonstration of Basic Computations in Tensor Flow
2. Implementation of Perceptron Model to solve binary classification problem
3. Implementation of Sigmoid model to solve binary classification problem
4. Implementation of Fully Connected Neural Network Model to solve Binary / Multi Class Classification problem
5. Implementation of Fully Connected Neural Network Model to solve Regression Problem
6. Implementation of Hyper Parameter Tuning Algorithms
7. Implementation of Convolution Neural Networks for Image Classification.
8. Implementation of Modern and Pre Trained CNN Architectures for Image Classification.
9. Implementation of Recurrent Neural Network Models for Time Series data.
10. Implementation of Recurrent Neural Network Models for Text Data
11. Implementation of LSTM Model for Machine Translation
12. Implementation of GRU Model for seq2seq Model
13. Implementation of AutoEncoder Models for Image Generation

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**BLOCKCHAIN TECHNOLOGY LAB**  
**(PEC – III LAB)**

1. Introduction to remix IDE
2. Write a smart contract for voting and deploy using remix.
3. Write a smart contract for bidding and deploy using remix.
4. Write a smart contract for fund raising to a charity and deploy using remix.
5. Write a smart contract for maintaining savings account in a bank and deploy using remix.
6. Create metamask account.
7. Write a smart contract and add ERC tokens to it using Metamask.
8. Deploying a DApp that runs on a test network
9. Create and Deploy a Business Network on Hyperledger

10. Set up Hyperledger Fabric Blockchain using Hyperledger Composer locally
11. Create a private Blockchain and Connect to your Blockchain
12. Develop a business network Deploy and Test business networks
13. Create a new asset and sending it between nodes Perform mining between nodes

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**NATURAL LANGUAGE PROCESSING LAB**  
**(PEC-III LAB)**

**Prerequisites:** Python Programming, Machine Learning , Artificial Intelligence

**Course Objectives :**

1. To learn about morphological features of a word by analysing it.
2. To Understand the morphology of a word
3. To know the importance of context and size of training corpus in learning Parts of Speech(POS)
4. To understand the concept of chunking and Name Entity Recognition
5. To understand the parsing algorithms
6. To understand the semantic analysis and Information Retrieval Systems

## Course Outcomes :

Student will able to :

1. Develop the Tokenizer to perform the Text analysis
2. Develop the Statistical Language Models
3. Develop the parser to perform the syntax analysis
4. Perform the semantic analysis using POS Tagging
5. Solve the sentiment analysis problems and modelling the IR Systems

## List of Programs:

1. Demonstration of Basic Computations of NLTK Library
2. Implementation of Tokenizer
3. Demonstration of Normalization process, Substituting & Correcting Tokens
4. Implementation of various similarity measure metrics
5. Implementation of Statistical Language Models
6. Implementation of Morphological Analyzer & Generator
7. Implementation of NgramTagger
8. Implementation of chunker using POS tags information.
9. Implementation of Various Parsing Algorithms
10. Implementation of Name Entity Recognition(NER) using Hidden Markov Model
11. Implementation of NER using POS Tagging
12. Implementation of Sentiment analyzer using NER and machine learning and evaluation of NER
13. Implementation of Information Retrieval systems using vector space model

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## BIG DATA LAB

### (PEC-III LAB)

1. Install and test Apache Hadoop distributed file system(HDFS) and Setting up Hadoop on machine and execute HDFS commands.
2. Importing and exporting data into HDFS using Hadoop shell commands
3. Reading and writing data to HDFS and Setting the replication factor for HDFS.
4. Write a WordCount MapReduce sample program, bundling it, and running it using standalone Hadoop.
5. Write a program to calculate histograms using MapReduce.

6. Write a program to calculate scatter plots using MapReduce.

7. Hive programming:

Detailed Installation of Hive and Starting Hive.

- a) Create Managed and External Tables
- b) Drop Tables
- c) Alter Table
- d) Rename a Table
- e) Add Columns Delete or Replace Columns
- f) Load Data into Managed Tables
- g) Insert Data into Tables from Queries
- h) Export Data
- i) SELECT ... FROM Clauses

#### **8. PIG COMMANDS**

Write Pig Latin scripts sort, group, join, project, and filter data

#### **9 PIG LATIN MODES**

- a. Run the Pig Latin Scripts to find Word Count
- b. Run the Pig Latin Scripts to find a max temp for each and every year