# ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

# R18

## M.Tech (COMPUTER SCIENCE AND ENGINEERING)

**FOR**
**MASTER OF TECHNOLOGY TWO YEAR POST GRADUATE COURSE**
**(Applicable for the batches admitted from 2018-2019)**

**ANURAG GROUP OF INSTITUTIONS**
**(AUTONOMOUS)**
Venkatapur, Ghatkesar, Hyderabad – 500 088

**R 18 - ACADEMICREGULATIONS (CBCS) FOR M. Tech. (REGULAR) DEGREE PROGRAMMES**

Applicable for the students of M. Tech. (Regular) programme from the Academic Year *2018-19* and onwards

The M.Tech. Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

## 1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above programme shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.

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 laid down by the Govt. from time to time.

## 2.0 AWARD OF M.Tech. DEGREE

2.1     A student shall be declared eligible for the award of the M.Tech. Degree, if he pursues a course of study in not less than two and not more than four academic years, failing which he shall forfeit his seat in M.Tech. programme.

2.2      The student shall register for all 88 credits and secure all the 88 credits.

2.3     The minimum instruction days in each semester are 90.

## 3.0 COURSES OF STUDY

The following specializations are offered at present for the M.Tech. programme of study.

1. CAD/CAM
2. Computer Networks and Information Security
3. Computer Science
4. Computer Science and Engineering
5. Construction Management
6. Electrical Power Systems
7. Electronics and Communication Engineering
8. Embedded Systems
9. Machine Design
10. Power Electronics and Electrical Drives
11. Software Engineering
12. Structural Engineering
13. VLSI System Design
14. Wireless and Mobile communication

**4     Course Registration**

   **4.1**   A 'Faculty Advisor or Counselor' shall be assigned to each student, who will advise him on the Post Graduate Programme (PGP), its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

   **4.2**   Academic Section of the College invites 'Registration Forms' from students with in 15 days from the commencement of class work through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

   **4.3**   A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor and the Student).

   **4.4**   If the Student submits ambiguous choices or multiple options or erroneous entries - during ON-LINE Registration for the Subject(s) / Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration.

   4.5    Subject/ Course Options exercised through ON-LINE Registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices will also not be considered. However, if the Subject/ Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

**5     ATTENDANCE**

The programmes are offered on a unit basis with each subject being considered a unit.

   5.1    Attendance in all classes (Lectures/Laboratories etc.) is compulsory. The minimum required attendance in each theory / Laboratory etc. is 75% including the days of attendance in sports, games, NCC and NSS activities for appearing for the End Semester examination. A student shall not be permitted to appear for the Semester End Examinations (SEE) if attendance is less than 75%.

   5.2    Condonation of shortage of attendance in each subject up to 10% (65% and above and below75%) in each semester shall be granted by the College Academic Committee on genuine medical grounds and valid reasons on representation by the candidate with supporting evidence.

5.3     Shortage of Attendance below 65% in each subject shall not be condoned.

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

5.5     A prescribed fees hall be payable towards condonation of shortage of attendance.

5.6     A candidate shall get minimum required attendance at least in three (3) theory subjects in the present semester to get promoted to the next semester. In order to qualify for the award of the M.Tech. Degree, the candidate shall complete all the academic requirements of the subjects, as per the course structure.

5.7     A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present Semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission in to the same class.

## 6     EVALUATION

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

6.1     For the theory subjects 75 marks shall be awarded for the performance in the Semester End Examination and 25 marks shall be awarded for Continuous Internal Evaluation (CIE). The Continuous Internal Evaluation shall be made based on the average of the marks secured in the two Mid Term-Examinations conducted, one in the middle of the Semester and the other, immediately after the completion of Semester instructions. Each mid-term examination shall be conducted for a total duration of 120 minutes with Part A as compulsory question (10 marks) consisting of 5 sub-questions carrying 2 marks each, and Part B with 3 questions to be answered out of 5 questions, each question carrying 5 marks.

There shall be an optional third midterm examination during the preparation cum external practical examinations period subject to the following.

i.   Interested students have to register for the third mid examination by paying prescribed registration fee.
ii.  Third midterm examination covers entire semester syllabus carrying 25 marks.
     The average of best two midterm examinations shall be taken as the final marks secured by each candidate. If he/she is absent for any test, he/she shall be awarded zero marks for that test.

The details of the Question Paper pattern for End Examination (Theory) are given below:

- The Semester End Examination will be conducted for 75 marks. It consists of two parts. i) Part-A for 25 marks, ii) Part-B for 50 marks.

- Part-A is a compulsory question consisting of 5 questions, one from each unit and carries 5 marks each.

- Part-B to be answered 5 questions carrying 10 marks each. There will be two questions from each unit and only one should be answered.

6.2      For practical subjects, 75 marks shall be awarded for performance in the Semester End Examinations and 25 marks shall be awarded for day-to-day performance as Internal Marks.

6.3      The practical end semester examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed by the Principal from the panel of examiners recommended by Chairman, Board of Studies in respective Branches.

6.4      There shall be two seminar presentations during I year I semester and II semester. For seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Departmental Academic Committee consisting of Head of the Department, Supervisor and two other senior faculty members of the department. For each Seminar there will be only internal evaluation of <u>100</u> marks. A candidate has to secure a minimum of 50% of marks to be declared successful. If he fails to fulfill minimum marks, he has to reappear during the supplementary examinations.

6.5      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 subjects he has studied during the M.Tech. course of study. The Head of the Department shall be associated with the conduct of the Comprehensive Viva-Voce through a Committee. The Committee consisting of Head of the Department, one senior faculty member and an external examiner. The external examiner shall be appointed by the Principal from the panel of 3 examiners recommended by Chairman, Board of Studies in respective Branches. There are no internal marks for the Comprehensive Viva-Voce and evaluates for maximum of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful. If he fails to fulfill minimum marks, he has to reappear during the supplementary examinations.

6.6      Technical Paper Writing shall cover concepts of abstract, introduction, material and methods, conclusion, references, acknowledgement etc of advanced topics in a branch of Engineering through the medium of attending seminars/ referring to peer reviewed journals, which will enhance the skill of writing technical reports. The students shall not be required to give oral presentation of technical paper. The report shall be presented as a printed document for evaluation. Evaluation shall be made solely by the teacher, but may be moderated by committees appointed by the Head of the Department.

6.7 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the Semester End Examination and a minimum aggregate of 50% of the total marks in the Semester End Examination and Continuous Internal Evaluation taken together.

6.8 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 6.7) he has to reappear for the Semester End Examination in that subject.

6.9 A candidate shall be given one chance to re-register for the subjects if the internal marks secured by a candidate is less than 50% and failed in that subject for maximum of two subjects and should register within four weeks of commencement of the class work. In such a case, the candidate must re-register for the subjects and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the Semester End Examination in those subjects. In the event of the student taking another chance, his Continuous Internal Evaluation (internal) marks and Semester End Examination marks obtained in the previous attempt stands cancelled.

6.10 In case the candidate secures less than the required attendance in any subject, he shall not be permitted to write the Semester End Examination in that subject. He shall re-register for the subject when next offered.

## 7 Examinations and Assessment - The Grading System

7.1 Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab/Practicals, or Seminar, or Project, etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 6 above, and a corresponding Letter Grade shall be given.

7.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed:

| % of Marks Secured (Class Intervals) | Letter Grade (UGC Guidelines) | Grade Points |
|---|---|---|
| 90% and above ( $\geq 90\%, \leq 100\%$ ) | O (Outstanding) | 10 |
| Below 90% but not less than 80% ( $\geq 80\%, < 90\%$ ) | $A^+$ ( Excellent) | 9 |
| Below 80% but not less than 70% ( $\geq 70\%, < 80\%$ ) | A ( Very Good) | 8 |
| Below 70% but not less than 60% ( $\geq 60\%, < 70\%$ ) | $B^+$ (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 |

7.3    A student obtaining F Grade in any Subject shall be considered 'failed' and is be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subjects will remain the same as those he obtained earlier.

7.4    A student not appeared for examination then 'Ab' Grade will be allocated in any Subject shall be considered 'failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when offered.

7.5    A Letter Grade does not imply any specific Marks percentage and it will be the range of marks percentage.

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

7.7    A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course. The corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

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

7.8    The Student passes the Subject/ Course only when he **gets GP $\geq 6$(B Grade or above).**

7.9    The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$$\textbf{SGPA} = \left\{ \sum_{i=1}^{N} C_i G_i \right\} / \left\{ \sum_{i=1}^{N} C_i \right\} \textbf{ For each Semester},$$

where 'i' is the Subject indicator index (takes into account all Subjects in a Semester), 'N' is the no. of Subjects '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 ith Subject, and G represents the Grade Points (GP) corresponding to the Letter Grade awarded for that i[th] Subject.

7.10 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 the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the

Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

$$\textbf{CGPA} = \left\{\sum_{j=1}^{M} C_j G_j\right\} / \left\{\sum_{j=1}^{M} Cj\right\} \textbf{... for all S Semesters registered}$$

**(ie., upto and inclusive of S Semesters, $S \geq 2$),**

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1st Semester onwards upto and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), C is the no. of Credits allotted to the jth Subject, and G represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth Subject. 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.

**7.11** For Calculations listed in Item 7.6 – 7.10, performance in failed Subjects/ Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/ Courses will also be included in the multiplications and summations.


**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 Chairperson, Project Supervisor and one senior faculty member of the Departments offering the M.Tech. Programme.

8.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, 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 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 College/School/Institute.

8.8 For Project work **Review I** in II Year I Sem. there is an internal marks of 100, the evaluation should be done by the PRC for 50 marks and Supervisor will evaluate for 50 marks. The Supervisor and PRC will examine the Problem Definition, Objectives, Scope of Work, Literature Survey in the same domain. A candidate has to secure a minimum of 50% of marks to be declared successful for Project Work Review I. If he fails to fulfill minimum marks, he has to reappear as per the recommendations of the PRC.

8.9 For Project work **Review II** in II Year II Sem. there is an internal marks of 100, the evaluation should be done by the PRC for 50 marks and Supervisor will evaluate for 50 marks. The PRC will examine the overall progress of the Project Work and decide the Project is eligible for final submission or not. A candidate has to secure a minimum of 50% of marks to be declared successful for Project Work Review II. If he fails to fulfill minimum marks, he has to reappear as per the recommendations of the PRC.

8.10 After approval from the PRC, a soft copy of the thesis should be submitted for ANTI-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 attempts, the admission is liable to be cancelled. The college authorities are advised to make plagiarism check of every soft copy of thesis before submissions.

8.11 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College, after submission of a research paper related to the project work in a UGC approved journal. A copy of the submitted research paper shall be attached to thesis.

8.12 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.

8.13 If he fails to fulfill as specified in 8.12, he will reappear for the Viva-Voce examination only after three months. In the reappeared examination also, fails to fulfill, he will not be eligible for the award of the degree.

8.14 The thesis shall be adjudicated by one examiner selected by the Institution. For this, Chairmen, BOS 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.

8.15 If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis. If the report of the examiner is un favourable again, the thesis shall be summarily rejected.

8.16 If the report of the examiner is favourable, 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.

8.17 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 Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes the examinations prescribed in the entire PG Programme (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 admitted.

9.2 **Award of Class**

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

| Class Awarded | CGPA |
|---|---|
| First Class with Distinction | $\geq 7.75$ |
| First Class | $6.75 \leq CGPA < 7.75$ |
| Second Class | $6.00 \leq CGPA < 6.75$ |

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, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

## 11. TRANSITORY REGULATIONS

11.1 If any candidate is detained due to shortage of attendance in one or more subjects, they are eligible for re-registration to maximum of two earlier or equivalent subjects at a time as and when offered.

11.2 The candidate who fails in any subject will be given two chances to pass the same subject; otherwise, he has to identify an equivalent subject as per R18 Academic

Regulations.

## 12       **GENERAL**

12.1 **Credit**: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

12.2 **Credit Point:** It is the product of grade point and number of credits for a course.

12.3 Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her".

12.4 The academic regulation should be read as a whole for the purpose of any interpretation.

12.5 In the case of any doubt or ambiguity in the interpretation of the above rules, the Decision of the Academic Council is final.

12.6 The Academic Council may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Academic Council.

# MALPRACTICES RULES
## DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

| | Nature of Malpractices/Improper conduct | Punishment |
|---|---|---|
| | If the candidate: | |
| . (a) | Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm, computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the 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 will be handed over to the police and a case is registered against him. |
| 2. | Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidates 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 and sent to the controller of examinations, AGI. |
| 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 practical's 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 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 will be handed over to the police and a case is registered against him. |
| 4. | Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidates 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 semester examinations. The continuation of the course by the |

| | | candidate is subject to the academic regulations in connection with forfeiture of seat. |
|---|---|---|
| 5. | Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks. | Cancellation of the performance in that 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 in or outside the examination hall of any injury to his person or to any office relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subjects 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 is registered against them. |
| 7. | Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidates 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 semester examinations. The continuation of the course by the candidate is subject to the academic regulation in connection with forfeiture of seat. |
| 8. | Posses any lethal weapon or firearm in the examination hall. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidates 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. |
| 9. | If student of the college, who is not a candidate for the particular examination or any person not connected with college indulges in any malpractice or improper conduct mentioned in clause 6 to 8 | Student of the college's expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidates 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 forfeiture the seat. |
| | | Person(s) who do not belong to the College |

| | | will be handed over to police and, a police case will be registered against them. |
|---|---|---|
| 10. | Comes in a drunken condition to the examination hall. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidates has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. |
| 11. | Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny. | Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of the 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 Malpractices committee, AGI for further action to award suitable punishment. | |

# ANURAG GROUP OF INSTITUTIONS

## M. Tech in COMPUTER SCIENCE AND ENGINEERING

### EFFECTIVE FROM ACADEMIC YEAR 2018- 19 ADMITTED BATCH

### COURSE STRUCTURE AND SYLLABUS

**I Semester**

| Category | Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|---|
| A31039 | Advanced Algorithms | 25 | 75 | 4 | 0 | 0 | 4 |
| A31040 | Computer Networking | 25 | 75 | 4 | 0 | 0 | 4 |
| A31041 | Software Engineering | 25 | 75 | 4 | 0 | 0 | 4 |
| A31042<br>A31043<br>A31044<br>A31045 | 1. Network Security and Cryptography<br>2. Mobile Application Development<br>3. Graph Theory<br>4. Internet of Things | 25 | 75 | 3 | 0 | 0 | 3 |
| A31046<br>A31047<br>A31048<br><br>A31049 | 1. Game Theory<br>2. Parallel and Distributed Algorithms<br>3. Software Architecture and Design Patterns<br>4. Embedded Systems | 25 | 75 | 3 | 0 | 0 | 3 |
| | *Open Elective – 1 | 25 | 75 | 3 | 0 | 0 | 3 |
| A31209 | Advanced Algorithms Lab | 25 | 75 | 0 | 0 | 3 | 2 |
| A31210 | Seminar-I | 100 | 0 | 0 | 0 | 3 | 2 |
| | **Total** | **275** | **525** | **21** | **0** | **6** | **25** |

**II Semester**

| Category | Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|---|
| A32039 | Network Programming | 25 | 75 | 4 | 0 | 0 | 4 |
| A32040 | Distributed Systems and Cloud Computing | 25 | 75 | 4 | 0 | 0 | 4 |
| A32041 | Theory of Computation | 25 | 75 | 4 | 0 | 0 | 4 |
| A32042<br>A32043<br>A32044<br>A32045 | 1. Data Warehousing and Data Mining<br>2. Storage Area Networks<br>3. Semantic Web and Social Networks<br>4. Cyber Security | 25 | 75 | 3 | 0 | 0 | 3 |
| A32046<br>A32047<br>A32048<br><br>A32049 | 1. Big Data Analytics<br>2. Soft Computing<br>3. Software Process and Project Management<br>4. Machine Learning | 25 | 75 | 3 | 0 | 0 | 3 |
| | *Open Elective – 2 | 25 | 75 | 3 | 0 | 0 | 3 |
| A32209 | Internet Technologies and Services Lab | 25 | 75 | 0 | 0 | 3 | 2 |
| A32210 | Seminar -II | 100 | 0 | 0 | 0 | 3 | 2 |
| | **Total** | **275** | **525** | **21** | **0** | **6** | **25** |

**III Semester**

|  | Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|---|
| A33213 | Technical Paper Writing | 100 | 0 | 0 | 3 | 0 | 2 |
| A33214 | Comprehensive Viva-Voce | 0 | 100 | 0 | 0 | 0 | 4 |
| A33215 | Project work Review II | 100 | 0 | 0 | 0 | 22 | 8 |
|  | **Total** | **200** | **100** | **0** | **3** | **22** | **14** |

**IV Semester**

|  | Course Title | Int. marks | Ext. marks | L | T | P | C |
|---|---|---|---|---|---|---|---|
| A34209 | Project work Review III | 100 | 0 | 0 | 0 | 24 | 8 |
| A34210 | Project Evaluation (Viva-Voce) | 0 | 100 | 0 | 0 | 0 | 16 |
|  | **Total** | **100** | **100** | **0** | **0** | **24** | **24** |

**\*Open Elective subjects must be chosen from the list of open electives offered by OTHER departments.**

**# For Project review I, please refer 7.10 in R18 Academic Regulations.**

**ANURAG GROUP OF INSTITUTIONS**

**M. Tech. I Year – I Sem CSE**

**ADVANCED ALGORITHMS (PC -1)**

**Course Objectives:**
> The fundamental design, analysis, and implementation of basic data
> structures. Basic concepts in the specification and analysis of programs.
> Principles for good program design, especially the uses of data
> abstraction. Significance of algorithms in the computer field
> Various aspects of algorithm
> development Qualities of a good solution

**Unit - I : Introduction -** Role of algorithms in computing, Analyzing algorithms, Designing Algorithms, Growth of Functions, Divide and Conquer- The maximum-subarray problem, Strassen's algorithms for matrix multiplication, The substitution method for solving recurrences, The recurrence-tree method for solving recurrence, The master method for solving recursions, Probabilistic analysis and random analysis.

**Unit - II: Review of Data Structures**- Elementary Data Structures, Hash Tables, Binary Search Trees, Red-Black Trees.

**Unit - III: Dynamic Programming -** Matrix-chain multiplication, Elements of dynamic programming, Longest common subsequence, Greedy Algorithms **-** Elements of the greedy strategy, Huffman codes, Amortized Analysis - Aggregate analysis, The accounting method, The potential method, Dynamic tables.

**Unit - IV: Graph Algorithms -** Elementary Graph Algorithms, Minimal spanning trees, Single-Source Shortest Paths, Maximum flow.

**Unit - V: NP-Complete & Approximate Algorithms**-Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-complete & approximation problems - Clique problem, Vertex-cover problem, formula satisfiability, 3 CNF Satisfiabilty, The vertex-cover problem, The traveling-salesman problem, The subset-sum problem.

**TEXT BOOKS:**
1. "Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Third *Edition*, PHI Publication.
2. "Data Structures and Algorithms in C++", M.T. Goodrich, R. Tamassia and D.Mount, Wiley India.

**REFERENCES:**
1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Second Edition, Galgotia Publication
2. Data structures with C++, J. Hubbard, Schaum's outlines, TMH.
3. Data structures and Algorithm Analysis in C++, $3^{rd}$ edition, M. A. Weiss, Pearson.
4. Classic Data Structures, D. Samanta, $2^{nd}$ edition, PHI.

**ANURAG GROUP OF INSTITUTIONS**

**M. Tech. I Year - I Sem. (CSE)**

**COMPUTER NETWORKING (PC -2)**

### UNIT-1

The internet architecture, Access Networks, The network Core, Peer-to-Peer Networks, Content Distribution Networks, Delay Tolerant Networks, Circuit Switching vs. Packet switching, Packet switching Delays and congestion, Client/Server and Peer-to-Peer Architectures, MAC and LLC, Virtual LAN, Asynchronous Transfer Mode (ATM)

### 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, 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, 3G Cellular Data Networks: Extending the Internet to Cellular Subscribers, On to 4G: LTE, Mobility Management: Principles, Addressing, Routing to a Mobile Node, Mobile IP ,Managing Mobility in Cellular Networks, Routing Calls to a Mobile User, Handoffs in GSM, Wireless and Mobility: Impact on Higher-Layer Protocols

### UNIT-5

Explaining IP Multicasting, 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. Computer Networking: A Top-Down Approach, 6/e, James F. Kurose and Keith W. Ross, Pearson Education, 2012.
2. Larry L. Peterson and Bruce S. Davie, Computer Networks: A systems approach, Morgan Kaufman, 5th Edition, 2012
3. Data Communications and Networking, *Behrouz A. Forouzan*, Fourth Edition, Tata McGraw Hill
4. High Speed Networks and Internets – Performance and Quality of Service, *William Stallings,* Second Edition, Pearson Education.
5. Top-Down Network Design, *Priscilla Oppenheimer,* Second Edition, Pearson Education (CISCO Press)

**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$^{th}$ Edition, 2014
11. G. Wright and W. Stevens, TCP/IP Illustrated, Volume 1 and Volume 2, Addison-Wesley, 1996

**ANURAG GROUP OF INSTITUTIONS**

**M. Tech- I Year – I Sem CSE**

**SOFTWARE ENGINEERING (PC - 3)**

**Prerequisites:**
A course on "Computer Programming and Data Structures" A
course on "Object Oriented Programming Through Java"

**Course Objectives:**
The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

**Course Outcomes:**
Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices.
Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

**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 modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.

**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$^{th}$ edition, Mc Graw Hill International Edition.
2. Software Engineering- Sommerville, 7$^{th}$ edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rambaugh, 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.

**ANURAG GROUP OF INSTITUTIONS**

**M. Tech. I Year – I Sem CSE**

**NETWORK SECURITY AND CRYPTOGRAPHY**
**(Professional Elective- 1)**

**Course Objectives:**

Understand the basic categories of threats to computers and
networks Understand various cryptographic algorithms.
Describe public-key cryptosystem.
Describe the enhancements made to IPv4 by IPSec
Understand Intrusions and intrusion detection
Discuss the fundamental ideas of public-key cryptography.
Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
Discuss Web security and Firewalls

**Course Outcomes:**

Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
Ability to identify information system requirements for both of them such as client and
server. Ability to understand the current legal issues towards information security

**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 : Atul Kahate, Mc Graw 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 : Forouzan Mukhopadhyay, Mc Graw 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

# ANURAG GROUP OF INSTITUTIONS

## M. Tech. I Year – I Sem CSE

## MOBILE APPLICATION DEVELOPMENT
### (Professional Elective- 1)

**Course Objectives:**

> To demonstrate their understanding of the fundamentals of Android operating
> systems To demonstrate their skills of using Android software development tools
> To demonstrate their ability to develop software with reasonable complexity on mobile
> platform

To demonstrate their ability to deploy software to mobile devices

To demonstrate their ability to debug programs running on mobile devices

**Unit - I:**

**Introduction to Android Operating System:** Android OS design and Features – Android development framework, SDK features, Installing and running applications on Eclipse platform, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools. Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

**Unit - II:**

**Android User Interface:** Measurements – Device and pixel density independent measuring
units Layouts – Linear, Relative, Grid and Table Layouts
User Interface (UI) Components – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers
Event Handling – Handling clicks or changes of various UI components
Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing, and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

**Unit - III**

**Intents and Broadcasts:** Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS
Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity
Notifications – Creating and Displaying notifications, Displaying
Toasts **Unit - IV**
**Persistent Storage:** Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference
Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and deleting data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

**Unit - V**
**Advanced Topics:** Alarms – Creating and using alarms
Using Internet Resources – Connecting to internet resource, using download manager

Location Based Services – Finding Current Location and showing location on the Map, updating location

**TEXT BOOKS:**
1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

**REFERENCES:**
1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

**ANURAG GROUP OF INSTITUTIONS**

**M. Tech. I Year – I Sem CSE**

**GRAPH THEORY**
**(Professional Elective- 1)**

**Unit - I:**
**Introduction-**Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product,    Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

**Unit - II:**
**Connected graphs and shortest paths** - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm.

**Unit III:**
**Trees**- Definitions and characterizations, Number of trees, Cayley's formula, Kircho-matrix-tree theorem, Minimum spanning trees, Kruskal's algorithm, Prim's algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury's algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

**Unit IV:**
**Independent sets coverings and matchings –** Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall's Theorem, K¨onig's Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

**Unit - V:**
**Vertex Colorings**- Basic definitions, Cliques and chromatic number, Mycielski's theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

**TEXTBOOKS**:
1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics. Springer, 1$^{st}$ edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications
   https://www.iro.umontreal.ca/~hahn/IFT3545/GTWA.pdf

**REFERENCES:**

**Lecture Videos:** http://nptel.ac.in/courses/111106050/13

**ANURAG GROUP OF INSTITUTIONS**

**M. Tech. I Year – I Sem CSE**

**INTERNET OF THINGS**
**(Professional Elective- 1)**

**Course Objectives:**
> To introduce the terminology, technology and its applications
>> To introduce the concept of M2M (machine to machine) with necessary protocols To
>> introduce the Python Scripting Language which is used in many IoT devices To
>> introduce the Raspberry PI platform, that is widely used in IoT applications
> To introduce the implementation of web based services on IoT devices

**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 enabaled 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, Arshdeep Bahga and Vijay Madisetti, Universities
   Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014,
   ISBN: 9789350239759

**ANURAG GROUP OF INSTITUTIONS**

**M. Tech. I Year – I Sem CSE**

**GAME THEORY**
**(Professional Elective- 2)**

**UNIT - I:**
**Introduction:** Game Theory, Games and Solutions Game Theory and the Theory of Competitive Equilibrium, Rational Behavior, The Steady State and Deductive Interpretations, Bounded Rationality Terminology and Notation
Nash Equilibrium- Strategic Games, Nash Equilibrium Examples Existence of a Nash Equilibrium, Strictly Competitive Games, Bayesian Games: Strategic Games with Imperfect Information

**UNIT - II**:
Mixed, Correlated, and Evolutionary Equilibrium -Mixed Strategy Nash Equilibrium Interpretations of Mixed Strategy Nash Equilibrium Correlated Equilibrium Evolutionary Equilibrium
Rationalizability and Iterated Elimination of Dominated Actions-Rationalizability Iterated Elimination of Strictly Dominated Actions, Iterated Elimination of Weakly Dominated Actions

**UNIT - III:**
Knowledge and Equilibrium -A Model of Knowledge Common Knowledge, Can People Agree to Disagree? , Knowledge and Solution Concepts, The Electronic Mail Game

**UNIT - IV**:
Extensive Games with Perfect Information -Extensive Games with Perfect Information        Subgame Perfect Equilibrium  Two Extensions of the Definition of a Game  The Interpretation of a Strategy , Two Notable Finite Horizon Games , Iterated Elimination of Weakly Dominated Strategies
Bargaining Games -Bargaining and Game Theory , A Bargaining Game of Alternating Offers Subgame Perfect Equilibrium Variations and Extensions

**UNIT - V**:
Repeated Games - The Basic Idea        Infinitely Repeated Games vs.\ Finitely Repeated Games Infinitely Repeated Games: Definitions        Strategies as Machines        Trigger Strategies: Nash Folk Theorems  Punishing for a Limited Length of Time: A Perfect Folk Theorem for the Limit of Means Criterion Punishing the Punisher: A Perfect Folk Theorem for the Overtaking Criterion Rewarding Players Who Punish: A Perfect Folk Theorem for the Discounting Criterion The Structure of Subgame Perfect Equilibria Under the Discounting Criterion Finitely Repeated Game

**TEXT BOOKS:**
1. M. J. Osborne and A. Rubinstein, A course in Game Theory, MIT Press
2. Roger Myerson, Game Theory, Harvard University Press
3. D. Fudenberg and J. Tirole, Game Theory, MIT Press

**REFERENCES:**
1. J. von Neumann and O. Morgenstern, Theory of Games and Economic Behavior, New York: John Wiley and Sons.
2. R.D. Luce and H. Raiffa, Games and Decisions, New York: John Wiley and Sons.,
3. G. Owen, Game Theory, (Second Edition), New York: Academic Press,

**ANURAG GROUP OF INSTITUTIONS**

**M. Tech. I Year – I Sem CSE**

**PARALLEL AND DISTRIBUTED ALGORITHMS**
**(Professional Elective- 2)**

**Course Objectives:**

To learn parallel and distributed algorithms development techniques for shared memory and message passing models.

To study the main classes of parallel algorithms.

To study the complexity and correctness models for parallel algorithms.

**UNIT-I**

Basic Techniques, Parallel Computers for increase Computation speed, Parallel & Cluster Computing

**UNIT-II**

Message Passing Technique- Evaluating Parallel programs and debugging, Portioning and Divide and Conquer strategies examples

**UNIT-III**

Pipelining- Techniques computing platform, pipeline programs examples

**UNIT-IV**

Synchronous Computations, load balancing, distributed termination examples, programming with shared memory, shared memory multiprocessor constructs for specifying parallelist sharing data parallel programming languages and constructs, open MP

**UNIT-V**

Distributed shared memory systems and programming achieving constant memory distributed shared memory programming primitives, algorithms – sorting and numerical algorithms.

**TEXT BOOK:**

1. Parallel Programming, Barry Wilkinson, Michael Allen, Pearson Education, 2$^{nd}$ Edition.

**REFERENCE BOOK:**

1. Introduction to Parallel algorithms by Jaja from Pearson, 1992.

# ANURAG GROUP OF INSTITUTIONS

## M. Tech. I Year – I Sem CSE

## SOFTWARE ARCHITECTURE AND DESIGN PATTERNS
### (Professional Elective- 2)

**Course Objectives:** After completing this course, the student should be able to:

To understand the concept of patterns and the Catalog.

To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation, and consistency.

To understand the variety of implemented bad practices related to the Business and Integration tiers.

To highlight the evolution of patterns.

To how to add functionality to designs while minimizing complexity

To understand what design patterns really are, and are not

To learn about specific design patterns.

To learn how to use design patterns to keep code quality high without overdesign.

## UNIT - I
### Envisioning Architecture
The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.
### Creating an Architecture
Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

## UNIT - II
### Analyzing Architectures
Architecture Evaluation, Architecture design decision making, ATAM, CBAM.
### Moving from one system to many
Software Product Lines, Building systems from off the shelf components, Software architecture in future.

## UNIT - III
### Patterns
Pattern Description, Organizing catalogs, role in solving design problems, Selection and usage.
### Creational and Structural patterns
Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight.

## UNIT - IV
### Behavioral patterns
Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

## UNIT - V
### Case Studies
A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development,

**TEXT BOOKS:**
1. Software Architecture in Practice, second edition, Len Bass, Paul Clements & Rick Kazman, Pearson Education, 2003.
2. Design Patterns, Erich Gamma, Pearson Education, 1995.

**REFERENCE BOOKS:**
1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001
3. Software Design, David Budgen, second edition, Pearson education, 2003
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006
6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
7. Design Patterns in C#, Steven John metsker, Pearson education, 2004.
8. Pattern Oriented Software Architecture, F. Buschmann & others, John Wiley & Sons.

**M. Tech. I Year – I Sem CSE**

**EMBEDDED SYSTEMS**
**(Professional Elective- 2)**

**Course Objectives:**

To explain various embedded system applications and design requirements. To construct embedded system hardware.
To develop software programs to control embedded system.

To generate product specification for embedded system.

**UNIT - I**
**Introduction to Embedded Systems:** Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices in a System, Embedded Software, Complex System Design, Design Process in Embedded System, Formalization of System Design, Classification of Embedded Systems

**UNIT - II**
**8051 and Advanced Processor Architecture:** 8051 Architecture, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts, Introduction to Advanced Architectures, Real World Interfacing, Processor and Memory organization - **Devices and Communication Buses for Devices Network:** Serial and parallel Devices & ports, Wireless Devices, Timer and Counting Devices, Watchdog Timer, Real Time Clock, Networked Embedded Systems, Internet Enabled Systems, Wireless and Mobile System protocols

**UNIT - III**
**Embedded Programming Concepts:** Software programming in Assembly language and High Level Language, Data types, Structures, Modifiers, Loops and Pointers, Macros and Functions, object oriented Programming, Embedded Programming in C++ & JAVA

**UNIT IV**
**Real – Time Operating Systems:** OS Services, Process and Memory Management, Real – Time Operating Systems, Basic Design Using an RTOS, Task Scheduling Models, Interrupt Latency, Response of Task as Performance Metrics - **RTOS Programming:** Basic functions and Types of RTOSES, RTOS VxWorks, Windows CE

**UNIT - V**
**Embedded Software Development Process and Tools:** Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-Design - **Testing, Simulation and Debugging Techniques and Tools:** Testing on Host Machine, Simulators, Laboratory Tools

**TEXT BOOK:**
1. Embedded Systems, Raj Kamal, Second Edition TMH.

**REFERENCE BOOKS:**
1. Embedded/Real-Time Systems, Dr. K.V.K.K. Prasad, dream Tech press
2. The 8051 Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Pearson.
3. The 8051 Microcontroller, Third Edition, Kenneth J Ayala, Thomson.

4. An Embedded Software Primer, David E. Simon, Pearson Education.
5. Micro Controllers, Ajay V Deshmukhi, TMH.
6. Microcontrollers, Raj kamal, Pearson Education.
7. Introduction to Embedded Systems, Shibu K.V, TMH.

# Anurag Group of Institutions

## M. TECH. I YEAR I SEMESTER

**List of Open Electives Offered by Various Departments, Effective from AY 2018- 19**

| S. No | Name of the Department | Open Elective (S) Offered for Other Departments | Subject Code |
|---|---|---|---|
| 1 | Civil Engineering (Open Elective – I) | Computational Methods in Engineering | A31010 |
| 2 | Electronics and Communication Engineering (Open Elective – I) | Principles of Electronic Communications | A31050 |
| 3 | Electrical and Electronics Engineering (Open Elective – I) | 1. Renewable Energy Systems, <br> 2. Electrical Installation & Safety | A31051 <br> A31052 |
| 4 | Mechanical Engineering (Open Elective – I) | Computer Oriented Numerical Methods | A31053 |
| 5 | Computer Science and Engineering (Open Elective – I) | 1. Fundamentals of Cyber Security <br> 2. Database Management System | A31054 <br> A31011 |

## OPEN ELECTIVE – I

## COMPUTATIONAL METHODS IN ENGINEERING

**UNIT-I:**
**INTRODUCTION TO NUMERICAL METHODS APPLIED TO ENGINEERING PROBLEMS**: Examples, solving sets of equation – Matrix notation – Determination and inversion – Iterative methods – Relaxation methods – System of non-linear equations – computer programs. **Numerical integration:** Newton-Cotes integration formulas – Simpson's rules, Gaussian quadrature. Adaptive integration.

**UNIT-II:**
**OPTIMIZATION:** One dimensional unconstrained optimization, multidimensional unconstrained optimization – direct methods and gradient search methods, constrained optimization.
**Boundary value problems and characteristic value problems:** Shooting method – Solution through a set of equations – Derivative boundary conditions – Rayieigh - Ritz method – Characteristic value problems,

**UNIT-III:**
**NUMERICAL SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS:** Laplace's equations – Representation as a difference equation – Iterative methods for Laplace's equations – poisson equation – Examples – Derivative boundary conditions – Irregular and non-rectangular grids – Matrix patterns, sparseness – ADI method – Finite element method.
**Parabolic partial differential equations:** Explicit method – Crank-Nickelson method – Derivative boundary condition – Stability and convergence criteria – Finite element for heat flow – computer programs.

**UNIT-IV:**
**HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS:** Solving wave equation by finite differences-stability of numerical method – method of characteristics wave equation in two space dimension-computer programs.

**UNIT- V:**
**Curve fitting and approximation of functions:** Least square approximation fitting of non-linear curves by least squares – regression analysis – multiple linear regression, non linear regression – computer programs.

**REFERENCES:**
1. Numerical Methods for Engineers/ Steven C.Chapra, Raymond P.Canale/ Tata Ma-Graw Hill
2. Applied numerical analysis / Curtis F.Gerald, partick.O.Wheatly /Addison-wesley,1989
3. Numerical methods / Douglas J.Faires, Riched Burden / Brooks-cole publishing company, 1998 Second edition.
4. Numerical mathematics and computing/ Ward cheney & David Kincaid / Brooks-cole publishing company 1999 fourth edition
5. Mathematical methods for physics and engineering / Riley K.F.M.P.Hobson & Bence S.J./ Cambridge university press,1999.

**ELECTRONICS AND COMMUNICATION ENGINEERING**
**PRINCIPLES OF ELECTRONIC COMMUNICATIONS**
**(Open Elective -1)**

**UNIT - I**
**Introduction:** Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

**UNIT - II**
**Simple description on Modulation:** Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

**UNIT - III**
**Telecommunication Systems:** Telephones Telephone system, Paging systems, Internet Telephony.
**Networking and Local Area Networks:** Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

**UNIT - IV**
**Satellite Communication:** Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.
**Optical Communication:** Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

**UNIT - V**
**Cellular and Mobile Communications:** Cellular telephone systems, AMPS, GSM, CDMA, WCDMA.
**Wireless Technologies:** Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

**TEXT BOOKS**
1. Louis E. Frenzel, "Principles of Electronic Communication Systems", 3$^{rd}$ Ed., McGraw Hill publications, 2008.
2. Kennady, Davis, "Electronic Communications systems", 4Ed., TMH, 1999

**REFERENCE BOOKS**
1. Tarmo Anttalainen, "Introduction to Telecommunications Network Engineering", Artech House Telecommunications Library.
2. Theodore Rappaport, "Wireless Communications-Principles and practice", Prentice Hall, 2002.
3. Roger L. Freeman, "Fundamentals of Telecommunications", 2 Ed. Wiley publications.
4. Wayne Tomasi, "Introduction to data communications and networking", Pearson Education, 2005.

## ELECTRICAL AND ELECTRONICS ENGINEERING
## RENEWABLE ENERGY SYSTEMS
### (Open Elective - I)

**Course Objectives:**
- To recognize the awareness of energy conservation in students
- To identify the use of renewable energy sources for electrical power generation
- To collect different energy storage methods
- To detect about environmental effects of energy conversion

**Course Outcomes:**
- Upon the completion of this course, the student will be able to
- find different renewable energy sources to produce electrical power
- estimate the use of conventional energy sources to produce electrical energy role-play the fact that the conventional energy resources are depleted
- arrange Store energy and to avoid the environmental pollution

**Unit-I:**

Photo voltaic power generation ,spectral distribution of energy in solar radiation, solar cell configurations, voltage developed by solar cell, photo current and load current, practical solar cell performance, commercial photo voltaic systems, test specifications for PV systems, applications of super conducting materials in electrical equipment systems.

**Unit-II:**

Principles of MHD power generation, ideal MHD generator performance, practical MHD generator, MHD technology.
**Wind Energy conversion:** Power from wind, properties of air and wind, types of wind Turbines, operating characteristics.

**Unit-III:**

Tides and tidal power stations, modes of operation, tidal project examples, turbines and generators for tidal power generation.
**Wave energy conversion:** properties of waves and power content, vertex motion of Waves, device applications. Types of ocean thermal energy conversion systems Application of OTEC systems examples,

**Unit-IV:**

**Miscellaneous energy conversion systems:** coal gasification and liquefaction, biomass conversion, geothermal energy, thermo electric energy conversion, principles of EMF generation, description of fuel cells, Co-generation and energy storage, combined cycle co-generation, energy storage.
**Global energy position and environmental effects:** energy units, global energy position.

**Unit-V:**

Types of fuel cells, $H_2$-$O_2$ Fuel cells, Application of fuel cells – Batteries, Description of batteries, Battery application for large power. Environmental effects of energy conversion systems, pollution from coal and preventive measures steam stations and pollution, pollution free energy systems.

**TEXT BOOKS:**

1   "Energy conversion systems" by Rakosh das Begamudre, New age International publishers, New Delhi - 2000.

2   "Renewable Energy Resources" by John Twidell and Tony Weir, $2^{nd}$ Edition, Fspon & Co.

**REFERENCES:**

1.  "Understanding Renewable Energy Systems" by Volker Quaschning, 2005, UK.

2.  "Renewable Energy Systems-Advanced Conversion, Technologies & Applications" by Faner Lin Luo Honer Ye, CRC press, Taylor & Francis group.

## ELECTRICAL INSTALLATION & SAFETY
### (Open Elective - I)

**Course Objectives:**
- ➤ The course should enable the students to:
- ➤ Understand Electrical Wiring with IE rules. Residential Building Electrification, Electrification of commercial Installation, Electrification of factory unit Installation
- ➤ Protection against electric shocks, Safety Measures & Prevention of Accidents

**Course Outcomes:**
- ➤ The students will be able to:
- ➤ Acquire the knowledge of different types wires and wiring systems, I.E. rules and Electric supply act.
- ➤ Explain the importance of earthling, rating of wires & cables, procedures for residential, commercial electrification.
- ➤ Able to estimate the length of wire, cable, conduit, earth wire, and earthing and also cost of residential, commercial electrification.

**Unit-I: Electrical Wiring with IE rules.**
Introduction, Define types of wires; Different types of wiring system; Comparison of different types of wiring; Different types and specifications of wiring materials; Accessories and wiring tools; Prepare I.E. rules for wiring, including Electricity supply act 2003& 2005;

**Unit-II : Residential Building Electrification**
General rules guidelines for wiring of Residential Installation and positioning of equipment's; Principles of circuit design in lighting and power circuits.; Procedures for designing the circuits and deciding the number of circuits.; Method of drawing single line diagram.; Selection of type of wiring and rating of wires &cables.; Load calculations and selection of size of conductor.; Selection of rating of main switch, distributions board, protective switchgear ELCB and MCB and wiring accessories.; Earthing of Residential Installation.

**Unit-III: Electrification of commercial Installation**
Concept of commercial Installation.; Differentiate between electrification of Residential and commercial Installation.; Fundamental considerations for planning of an electrical Installation system for commercial building.; Design considerations of electrical Installation system for commercial building.; Load calculations & selection of size of service connection and nature of supply.; Deciding the size of cables, bus bar and bus bar chambers.; Mounting arrangements and positioning of switch boards, distribution boards main switch etc.; Earthing of the electrical Installation; Selection of type wire, wiring system & layout.

**Unit-IV: Electrification of factory unit Installation**
Concept of Industrial load; Concept of Motor wiring circuit and single line diagram. Important guidelines about power wiring and Motor wiring.; Design consideration of Electrical Installation in small Industry/Factory/workshop.; Motor current calculations.; Selection and rating of wire, cable size
1. conduct.; Deciding fuse rating, starter, distribution boards main switch etc.; Deciding the cable route, determination of length of wire, cable, conduit, earth wire, and earthing.

**Unit-V: Protection against electric shocks**
Electric shock- General , Protection against direct contact, Protection against indirect contact, Protection of goods in case of insulation fault, Implementation of the TT system, Implementation of the TN system, Implementation of the IT system. Protection provided for enclosed equipment: codes IP

and IK, IP code definition, Elements of the IP Code and their meanings, IK Code definition, IP and IK code specifications for distribution switchboards

**Safety Measures & Prevention of Accidents-** Concept of electrical safety, electrical accidents, its causes & preventions.; Safety signs and symbols used in industry.; Electrical shocks and factors affecting the severity of it, method of rescuing electrocuted person & different methods of artificial respiration.; Electrical safety as per I.E. Rules 1956.; Do's & don'ts regarding safety while working on electrical installations.; Concept of Permit system, its preparation & regulation for attending to electrical work.; Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguishers, types of fire extinguishers.

**TEXT BOOKS:**
1. Dr. S.L. Uppal of Electrical Wiring, Estimating and Costing, New Age International (p) Limited, New Delhi.
2. Electrical Design Estimating and Costing, K.B. Raina & S.K. Battacharya, new age international (p) limited. Publishers
3. Electrical estimating & costing 2$^{nd}$ addition By Surjit singh
4. Electrical Installation Estimating & Costing, Gupta, J.B., S. K. Kataria & Sons, New Delhi

# MECHANICAL ENGINEERING

## COMPUTER ORIENTED NUMERICAL METHODS
### (Open Elective – 1)

**Unit - I:**

Solutions of linear equations: Direct method – Cramer's rule, Guass – Elimination method- Gauss – Jordan elimination – Triangulation (LU Decomposition) method – Iterative methods Jacobi – Iteration method – Gauss – Siedel iteration, Successive over –relaxation method.

Eigen values and Eigen vectors: Jacobi method for symmetric matrices- Given's method for symmetric matrices-Householder's method for symmetric matrices-Rutishauser method of arbitrary matrices – Power method.

**UNIT - II:**

Interpolation: Linear Interpolation – Higher order Interpolation – Lagrange Interpolation – Interpolating polynomials using finites differences- Hermite Interpolation –piece-wise and spline Interpolation.

**Unit - III**

Finite Difference and their Applications: Introduction- Differentiation formulas by Interpolating parabolas – Backward and forward and central differences- Derivation of Differentiation formulae using Taylor series- Boundary conditions- Beam deflection – Solution of characteristic value problems- Richardson's extrapolation- Use of unevenly spaced pivotal points- Integration formulae by interpolating parabolas- Numerical solution to spatial differential equations – Applications to Simply Supported Beams, Columns and Rectangular Plates.

**UNIT - IV**

Numerical Differentiation: Difference methods based on undetermined coefficients- optimum choice of step length– Partial differentiation.

Numerical Integration: Method based on interpolation-method based on undetermined coefficient – Gauss – Lagrange interpolation method- Radaua integration method- composite integration method – Double integration using Trapezoidal and Simpson's method – New Marks Method and Application to Beams – Calculation of Slopes and Deflections.

**UNIT - V**

Ordinary Differential Equation: Euler's method – Backward Euler method – Midpoint method – single step method, Taylor's series method- Boundary value problems.

**TEXT BOOKS:**
1. Numerical methods for scientific and engineering computations. M.K. Jain-S.R.K. Iyengar – R.K. Jain Willey Eastern Limited
2. Numerical Methods for Engineering Problems, N. Krishna Raju, KU Muthu, Mac-Millan publishers

**REFERENCES:**
1. Introductory Numerical Methods by S.S. Shastry, PHI Learning Pvt. Ltd.
2. Applied numerical analysis by – Curtis I. Gerala- Addission Wasley – published campus.
3. Numerical methods for Engineers Stevan C. Chopra, Raymond P. Canal Mc. Graw Hill Book Company.
4. C Language and Numerical methods by C. Xavier – New age international publisher.
5. Computer based numerical analysis by Dr. M. Shanta Kumar, Khanna Book publishers, New Delhi.

## COMPUTER SCIENCE AND ENGINEERING
## FUNDAMENTALS OF CYBER SECURITY
### (Open Elective - I)

**Course Objective:**
This course is aimed to generate interest and awareness in cyber security field, which is important in the world of information security due to the wide variety of computer crimes that take place in cyber space. The course deals with various types of attacks framed by an attacker, and the security which need to be implemented at various levels along with latest trends in cyber security.

**UNIT-I:**
Cyber Security Basics – Sphere, Terminology, Vulnerability in the Cyber Structure and Infrastructure, Cyber threats and Weaponry, Cyber Defense, Cyber Attack Detection and Prevention, Information Security Testing, Cyber Security Investigation/assessment, Cyber-Deterrence.

**UNIT-II:**
Cyber Crimes and Cyber Laws – Introduction, IT laws & Cyber Crimes – Internet, Hacking, Password Cracking, Viruses, Virus Attacks, Pornography, Software Privacy, Intellectual Property, Legal System of Information Technology, Social Engineering, Phishing, Denial of Service attack, Malicious Code, Mail Bombs, Worms, Logic Bombs, Botnet, Trojan, Bug Exploits.

**UNIT-III:**
**End point Security:** Desktop and Laptop Security, Cell Phone and PDA Security, Bluetooth Security, Patch and Vulnerability Management, Password Management, Security for Full Virtualization Technologies, Media Sanitization, Security Radio Frequency Identification (RFID) Systems. **Network Security:** Intrusion Detection & Prevention Systems, Firewalls and Firewall Policy, Computer Security Log Management, Enterprise Tele work and Remote Access Security, Securing WiMAX Wireless Communication. **Web Security:** Server Security, Web authentication, SSL and SET, Securing Public Web Servers, Secure Deployment of IPv6, Secure Domain name System (DNS) Deployment, SSL VPNs, Unified Threat Management (UTM).**;**

**UNIT-IV:**
**Application Security:** Active Content and Mobile Code, E-commerce Security, Email Security (PGP, S/MIME), Web Security, Web Application Security, OWASP; **Data Security:** Data Management, Database Security, Data Encryption, Data Leakage Prevention (DLP), Data Destruction; **Software Security:** Software Flaws, Malware, Software based Attacks; Insecurity in Software: SRE, Software Tamper Resistance, DRM, Software Development.
**Operating System Security:** Security Functions, Software Updates and Patches, OS Integrity Checks, Account management, Antivirus Software, Security in Ordinary Operating Systems, Design of Secure OS, OS hardening, Configuring the OS for security, Security kernels, Secure Virtual machine Systems, Trusted Operating System, NGSCB.

**UNIT-V:**
Recent Trends in Cyber Security – Zero – day Malware, Trojan Wars, New Ways to Monetize Non-Financial Data, Fraud-as-a-service, Out-of-band Methods forcing Cybercriminals to Innovate, The Rise of Hactivism, Attacks in mobile devices, social media and cloud computing; Insider threats, Increased regulatory security, Cyber-Terrorism, Cyber –War and Cyber-Peace. Topological Vulnerability Analysis, Cyber Situational Awareness, Secure Composition of Systems, Autonomic Recovery, Secure Data Centers, Cloud Computing Security, Privacy in location-Based Applications.

**TEXT BOOKS:**
1   Cyber Security, Edward Amoroso, kindle Edition, 2007
2   Cyber Security ,Understanding Cyber crimes, Computer Forensics and Legal Perspectives, Sunita Belapure and Nina Godbole, Wiley India Pvt Ltd. 2011

**REFERENCES:**
1.   Computer Security, Dirter Gollmann, John Wiley & Sons Publication, 2011
2.   Cyber Security Essentials, James Graham, Richard Howrad, Ryan Olson, CRC Press, 2011

## OPEN ELECTIVE – I
## DATA BASE MANAGEMENT SYSTEM

**UNIT-I**

Database System Applications, database system VS file system- view of data- data abstraction – instances and schemas – data models – the ER Model – Relational model – other models – Database languages – DDL – DML – database Access for applications programs – database users and administrator – transaction management – database system structure – storage manager – the query processor – history of database systems – database design and ER diagrams – Beyond ER design entities of ER model – concept design with the ER model – conceptual design for large enterprises.

**UNIT-II**

**RELATIONAL MODEL**: introduction to the relational model – integrity constraint over relations – enforcing integrity constraints – querying relational data – logical database design
– introduction to views – destroying / altering tables and views.

**Relational Algebra and Calculus** : relational algebra – selection and projection set operations – renaming – joins – division – examples of algebra overviews – relational calculus – tuple relational calculus – domain relational calculus – expressive power of algebra and calculus.

**UNIT – III**

Form of basic SQL Query – examples of basic SQL Queries – introduction to nested queries – correlated nested queries set – comparison operators – Aggressive operators -Null values – comparison using null values – logical connectivity's – AND, OR and NOTR – impact on SQL constructs – Outer joins – disallowing NULL values – complex integrity constraints in SQL Triggers and Active Database. Schema refinement – problems caused by redundancy – decompositions – problem related to decomposition – reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join decomposition – Dependency preserving Decomposition – Schema refinement in database design – Multi valued dependencies – forth Normal Form.

**UNIT-IV**

**OVERVIEW OF TRANSACTION MANAGEMENT:** ACID properties – Transactions and schedules –
concurrent execution of transaction – lock based concurrency control – performance locking – transaction support in SQL – Introduction to crash recovery. **Concurrency Control:** serializability and recoverability – introduction to lock management
– lock conversions dealing with dead locks – specialized locking techniques concurrency without locking.

**Crash recovery :** introduction to ARIES – the log – other recovery related structures – the write- Ahead Log Protocol – check pointing – recovering form a system crash – media recovery – other approaches and interaction with concurrency control.

**UNIT-V**

**OVERVIEW OF STORAGE AND INDEXING :** data on external storage – File organization and indexing – cluster indexing, primary and secondary indexes – index data structures – hash based indexing tree base indexing –comparison of file organizations – indexes and performance Tuning.

**Storage data: Disks and Files:** the Memory Hierarchy – redundant Arrays of independent – Disks – disk space management – buffer manager – files of records – page formats – record formats.

**Tree structure Indexing** : introduction for tree indexes – indexed sequential access methods
(ISAM)-B+ Tress: A dynamic Index structure.

**Hash based Indexing:** Static Hashing – extendable hashing – Linear Hashing – Extandable vs Linear hashing.

**REFERENCES:**

1. Database Management Systems/ Raghurama Krishnan, Johannes Gehrke/ TATA McGraw hills 3rd Edition.
2. Database systems Concepts/ Silberschatz, Korth/ McGraw hill, IV Edition
3. Database Management Systems/ P.Radha Krishna/ Hi-TECH Publications 2005
4. Introduction to Database Management Tent Systems / C.J.Date/ Pearson Education
5. Database Systems design, Implemantation and Management/ Rob & Coronel/ 5th Edition, Thomson.
6. Database Management Systems/ Elmasri Navrate/ Pearson Education.
7. Database Management Systems /Mathew Leon, Leon Vikas/
8. Database Systems / Connoley/ Pearson Education

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**M. Tech. I Year – I Sem CSE**

**ADVANCED ALGORITHMS LAB**

**Course Objectives:**
>    The fundamental design, analysis, and implementation of basic data
>    structures. Basic concepts in the specification and analysis of programs.
>    Principles for good program design, especially the uses of data abstraction.

**Sample Problems on Data structures:**

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
9.  Write a Java program that reads an infix expression and converts the expression to postfix form. (Use stack ADT).
10. Write a Java program to implement circular queue ADT using an array.
11. Write a Java program that uses both a stack and a queue to test whether the given string is a palindrome or not.
12. Write Java programs to implement the following using a singly linked list.
    - a) Stack ADT        b) Queue ADT
8. Write Java programs to implement the deque (double ended queue) ADT using
    - a) Array     b) Singly linked list          c) Doubly linked list.
9. Write a Java program to implement priority queue ADT.
10. 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.
11. Write a Java program to implement all the functions of a dictionary (ADT) using Hashing.
12. Write a Java program to implement Dijkstra's algorithm for Single source shortest path problem.
13. Write Java programs that use recursive and non-recursive functions to traverse the given binary tree in
    - a) Preorder      b) Inorder      c) Postorder.
14. Write Java programs for the implementation of bfs and dfs for a given graph.
15. 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
16. Write a Java program to perform the following operations: a) Insertion into a B-tree  b) Searching in a B-tree
17.  Write a Java program that implements Kruskal's algorithm to generate minimum cost spanning tree.
18. Write a Java program that implements KMP algorithm for pattern matching.

**REFERENCE BOOKS:**

1. Data Structures and Algorithms in java, 3$^{rd}$ edition, A.Drozdek, Cengage Learning.
2. Data Structures with Java, J.R.Hubbard, 2$^{nd}$ edition, Schaum's Outlines, TMH.
3. Data Structures and algorithms in Java, 2$^{nd}$ Edition, R.Lafore, Pearson Education.
4. Data Structures using Java, D.S.Malik and P.S. Nair, Cengage Learning.
5. Data structures, Algorithms and Applications in java, 2nd Edition, S.Sahani, Universities Press.
6. Design and Analysis of Algorithms, P. H. Dave and H.B.Dave, Pearson education.
7. Data Structures and java collections frame work, W. J. Collins, Mc Graw Hill.
8. Java: the complete reference, 7$^{th}$ edition, Herbert Schildt, TMH.
9. Java for Programmers, P. J. Deitel and H. M. Deitel, Pearson education / Java: How to Program P. J. Deitel and H. M. Deitel , 8$^{th}$ edition, PHI.
10. Java Programming, D.S. Malik, Cengage Learning.
11. A Practical Guide to Data Structures and Algorithms using Java, S. Goldman & K. Goldman, Chapman & Hall/CRC, Taylor & Francis Group.

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

**NETWORK PROGRAMMING (PC – 4)**

**Course Objectives:**
To understand to Linux utilities.
To understand file handling, signals.
To understand IPC, network programming in Java.
To understand processes to communicate with each other across a Computer Network.

### UNIT – I
Linux Utilities- File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities.  Bourne again shell(bash) - Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell,  shell script examples. Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

### UNIT - II
Files- File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod, fchmod, file ownership-chown, lchown , fchown, links-soft links and hard links – symlink, link, unlink.  File and Directory management – Directory contents, Scanning Directories- Directory file APIs. Process- Process concept, Kernel support for process, process attributes, process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

### UNIT - III
Signals- Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions. Interprocess Communication - Introduction to IPC mechanisms, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory. Message Queues- Kernel support for messages, UNIX system V APIs for messages, client/server example. Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.

### UNIT – IV
Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example. Network IPC - Introduction to Unix Sockets, IPC over a network, Client-Server model ,Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented - Communication, Socket system calls for Connectionless-Communication, Example-Client/Server Programs- Single Server-Client connection, Multiple simultaneous clients, Socket options – setsockopt, getsockopt, fcntl.

### UNIT-V
Network Programming in Java-Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs that can handle one connection at a time and multiple connections (using multithreaded server), Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

**TEXT BOOKS:**
1.Unix System Programming using C++, T.Chan, PHI.(Units II,III,IV)
2. Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.(Unit I)
3. An Introduction to Network Programming with Java, Jan Graba, Springer, rp 2010.(Unit V)
4. Unix Network Programming ,W.R. Stevens, PHI.(Units II,III,IV)
5. Java  Network Programming,3rd edition, E.R. Harold, SPD, O'Reilly.(Unit V)

**REFERENCE BOOKS:**

1. Linux System Programming, Robert Love, O'Reilly, SPD.
2. Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.
3. UNIX for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson   Education.
4. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition.
5. Unix Network Programming The Sockets Networking API, Vol.-I,W.R.Stevens, Bill Fenner, A.M.Rudoff, Pearson Education.
6. Unix Internals, U.Vahalia, Pearson Education.
7. Unix shell Programming, S.G.Kochan and P.Wood, 3rd edition, Pearson Education.
8. C Programming Language, Kernighan and Ritchie, PHI

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**M. Tech. I Year - II Sem. (CSE)**

**DISTRIBUTED SYSTEMS AND CLOUD COMPUTING (PC – 5)**

**Course Objectives:**
To explain the evolving computer model called cloud computing.
To introduce the various levels of services that can be achieved by cloud.
To describe the security aspects in cloud.

**Course Outcomes:**
Ability to understand the virtualization and cloud computing concepts.

**UNIT- I**
Systems Modeling, Clustering and Virtualization: Distributed System Models and Enabling Technologies, Computer Clusters for Scalable Parallel Computing, Virtual Machines and Virtualization of Clusters and Data centers.

**UNIT- II**
Foundations: Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the Cloud Era, The Enterprise Cloud Computing Paradigm.

**UNIT- III**
Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS / SAAS): Virtual machines provisioning and Migration services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing Cloud Computing Environments using a cluster as a Service, Secure Distributed Data Storage in Cloud Computing. Aneka, Comet Cloud, T-Systems', Workflow Engine for Clouds, Understanding Scientific Applications for Cloud Environments.

**UNIT- IV**
Monitoring, Management and Applications: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting Cloud Applications in the AWS cloud, Building Content Delivery networks using Clouds, Resource Cloud Mashups.

**UNIT - V**
Governance and Case Studies: Organizational Readiness and Change management in the Cloud age, Data Security in the Cloud, Legal Issues in Cloud computing, Achieving Production Readiness for Cloud Services.

**TEXT BOOKS:**
1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 2012.

**REFERENCE BOOKS:**
1. Cloud Computing : A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
2. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
3. Cloud Computing: Implementation, Management and Security, John W. Rittinghouse, James F.Ransome, CRC Press, rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly, SPD, rp2011.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

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**M. Tech- I Year – II Sem CSE**

**THEORY OF COMPUTATION (PC – 6)**

**Course Outcomes:**
Able to understand the concept of abstract machines and their power to recognize the languages.
Able to employ finite state machines for modeling and solving computing problems.
Able to design context free grammars for formal languages.
Able to distinguish between decidability and undecidability.
Able to gain proficiency with mathematical tools and formal methods.

**UNIT - I:**
Regular Languages –Finite Automata, Formal definition of finite automaton, Examples of finite automata, Formal definition of computation, Designing finite automata, The regular operations, Non determinism, formal definition of nondeterministic finite automaton, equivalence of NFAs and DFAs, closure under the regular operations, Regular Expressions, formal definition of a regular expression, equivalence with finite automata, Nonregular languages, The pumping lemma for regular languages.

**UNIT - II:**
Context-Free languages, Context-free grammars, formal definition of a Context-free grammar, Examples of context-free grammars, Designing context-free grammars, Ambiguity, Chomsky normal form, Pushdown Automata, Examples of pushdown Automata, Equivalence with context-free grammars, Non-context-free languages, The pumping lemma for context-free languages.

**UNIT - III:** The Church-Turing Thesis - Turing machines, Formal definition of turing machine, Examples of turing machines, Variants of turing machines, Multitape turing machines, Nondeterministic turing machine, Enumerators, Equivalence with other models, The definition of algorithm, Hilbert's problem, Terminology of describing turing machines.

**UNIT - IV:** Decidability – Decidable languages, Decidable problems concerning regular languages, Decidable problems concerning context-free languages, The halting problem, The diagonalization method, The halting method is undecidable, A turing –unrecognizable language, Reducibility – Undecidable problems for language theory, Reductions via computations histories, A simple undecidable problem, Mapping reducibility, computable functions, Formal definition of mapping reducibility.

**UNIT - V:** Time Complexity – Measuring complexity, Big – O and small-o notation, Analyzing algorithms, Complexity relationships among models, The class P, Polynomial time, examples of problems in P, The class NP, Examples of problems in NP, The P versus NP question, NP-Completeness, polynomial time reducibility, Definition of NP-Completeness, The Cook-Levin Theorem, Additional NPComplete problems, The vertex cover problem, The Hamiltonian path problem, The subset sum problem.

**TEXTBOOKS:**
1. Introduction to the theory of computation, Micheal Sipser, Third Edition, Cengage Learning.

**REFERENCES:**
1. Introduction to Languages and The Theory of Computation, John C Martin, TMH.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. A Text book on Automata Theory, P. K. Srimani, Nasir S. F. B, Cambridge University Press.
4. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan, Rama R, Pearson.
5. Theory of Computer Science – Automata languages and computation, Mishra and Chandrashekaran, 2nd edition, PHI.

**ANURAG GROUP OF INSTITUTIONS**

**M. Tech. I Year – II Sem CSE**

**DATA WAREHOUSING AND DATA MINING (PE – III)**

**Course Objectives:**
To develop the abilities of critical analysis to data mining systems and applications.
To implement practical and theoretical understanding of the technologies for data mining.
To understand the strengths and limitations of various data mining models;

**UNIT- I**
Data mining Overview and Advanced Pattern Mining: Data mining tasks – mining frequent patterns, associations and correlations, classification and regression for predictive analysis, cluster analysis , outlier analysis; advanced pattern mining in multilevel, multidimensional space – mining multilevel associations, mining multidimensional associations, mining quantitative association rules, mining rare patterns and negative patterns.

**UNIT- II**
Advance Classification: Classification by back propagation, support vector machines, classification using frequent patterns, other classification methods – genetic algorithms, roughest approach, fuzz>set approach;

**UNIT- III**
Advance Clustering: Density - based methods –DBSCAN, OPTICS, DENCLUE; Grid-Based methods – STING, CLIQUE; Exception – maximization algorithm; clustering High- Dimensional Data; Clustering Graph and Network Data.

**UNIT- IV**
Web and Text Mining: Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining – unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.

**UNIT- V**
Temporal and Spatial Data Mining: Introduction; Temporal Data Mining – Temporal Association Rules, Sequence Mining, GSP algorithm, SPADE, SPIRIT Episode Discovery, Time Series Analysis, Spatial Mining – Spatial Mining Tasks, Spatial Clustering. Data Mining Applications.

**TEXT BOOKS:**
1. Data Mining Concepts and Techniques, Jiawei Hang Micheline Kamber, Jian pei, Morgan Kaufmannn.
2. Data Mining Techniques – Arun K pujari, Universities Press.

**REFERENCE BOOKS:**
1. Introduction to Data Mining – Pang-Ning Tan, Vipin kumar, Michael Steinbach, Pearson.
2. Data Mining Principles & Applications – T.V Sveresh Kumar, B.Esware Reddy, Jagadish S Kalimani, Elsevier.

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## M. Tech. I Year – II Sem CSE

## STORAGE AREA NETWORKS (PE - III)

**Course Objectives:**
To understand Storage Area Networks characteristics and components.
To become familiar with the SAN vendors and their products.
To learn Fibre Channel protocols and how SAN components use them to communicate with each other.
To become familiar with Cisco MDS 9000 Multilayer Directors and Fabric Switches  Thoroughly learn Cisco SAN-OS features.
To understand the use of all SAN-OS commands. Practice variations of SANOS features

**UNIT - I:**
Introduction to Storage Technology Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities

**UNIT - II:**
Storage Systems Architecture Hardware and software components of the host environment, Key protocols and concepts used by each component ,Physical and logical components of a connectivity environment ,Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components , Different RAID levels and their suitability for different application environments:   RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Compare and contrast integrated and modular storage systems , High-level architecture and working of an intelligent storage system

**UNIT - III:**
Introduction to Networked Storage Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, understand the need for long-term archiving solutions and describe how CAS fulfills the need, understand the appropriateness of the different networked storage options for different application environments

**UNIT - IV:**
Information Availability & Monitoring & Managing Datacenter List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime, Differentiate between business continuity (BC) and disaster recovery (DR) ,RTO and RPO,  Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures , Architecture of backup/recovery and the different backup/recovery topologies , replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center

**UNIT - V:**
Securing Storage and Storage Virtualization Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain, Virtualization technologies, block-level and file-level virtualization technologies and processes.

**Case Studies:**
The technologies described in the course are reinforced with EMC examples of actual solutions.
Realistic case studies enable the participant to design the most appropriate solution for given sets of criteria.

**TEXT BOOK:**
1. EMC Corporation, Information Storage and Management, Wiley.
 **REFERENCE BOOKS:**
1. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne, 2003.
2. Marc Farley, "Building Storage Networks", Tata McGraw Hill ,Osborne, 2001.
3. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002

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**M. Tech. I Year – II Sem CSE**

**SEMANTIC WEB AND SOCIAL NETWORKS (PE – III)**

**Course Objectives:**
To learn Web Intelligence.
To learn Knowledge Representation for the Semantic Web.
To learn Ontology Engineering.
To learn Semantic Web Applications, Services and Technology.
To learn Social Network Analysis and semantic web

**UNIT – I:**
Web Intelligence: Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

**UNIT - II:**
Knowledge Representation for the Semantic Web: Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.

**UNIT- III:**
Ontology Engineering: Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.

**UNIT- IV:**
Semantic Web Applications, Services and Technology: Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods,

**UNIT - V:**
Social Network Analysis and semantic web What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion networks, Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social network features.

**TEXT BOOKS:**
1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008.
2. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

**REFERENCE BOOKS:**
1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
4. Programming the Semantic Web, T. Segaran, C.Evans, J. Taylor, O'Reilly, SPD.

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**M. Tech. I Year – II Sem CSE**

**CYBER SECURITY (PE - III)**

**Course Objectives:**
To learn about cyber crimes and how they are planned.
To learn the vulnerabilities of mobile and wireless devices.
To learn about the crimes in mobile and wireless devices.

**UNIT - I**
Introduction to Cybercrime: Introduction, Cybercrime and Information security, who are cybercriminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes. Cyber offenses: How criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

**UNIT- II**
Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

**UNIT - III**
Cybercrimes and Cyber security: the Legal Perspectives Introduction Cyber Crime and Legal Landscape around the world, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario In India, Digital signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment Cyber law, Technology and Students: Indian Scenario.

**UNIT - IV**
Understanding Computer Forensics Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques Forensics Auditing
**UNIT - V**
Cyber Security: Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

**TEXT BOOK:**
1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.
2. Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group.

**REFERENCE BOOK:**
1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

## M. Tech. I Year – II Sem CSE

## BIG DATA ANALYTICS (PE – IV)

**Course Objectives:**
To understand about big data.
To learn the analytics of Big Data.
To Understand the MapReduce fundamentals.

### UNIT – I
Big Data Analytics: 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, HDFC Files, File system types, commands, org.apache.hadoop.io package, HDF, HDFS High Availability; Introducing HBase, Architecture, Storing Big Data with HBase , Interacting with the Hadoop Ecosystem; HBase in OperationsProgramming 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; HDFC (Hadoop Distributed File System), HDFC 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, Subhasinin Chellappan, Wiley publications.
2. BIG DATA, Black BookTM , 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. Yuli Vasiliev, " Oracle Business Intelligence : The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

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## M. Tech. I Year – II Sem CSE

## SOFT COMPUTING (PE – IV)

**Course Objectives:**
To give students knowledge of soft computing theories fundamentals, i.e. Fundamentals of artificial and neural networks, fuzzy sets and fuzzy logic and genetic algorithms.

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

### UNIT- II
Artificial Neural Networks: Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back propagation Network. Associative Memory Networks. Traing Algorithms for pattern association, BAM and Hopfield Networks.

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

### UNIT- IV
Introduction to Classical Sets ( crisp Sets)and Fuzzy Sets- operations and Fuzzy sets. Classical Relations -and Fuzzy Relations- Cardinality, Operations, Properties and composition. Tolerance and equivalence relations. Membership functions- Features, Fuzzification, membership value assignments, Defuzzification.

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

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

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

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**M. Tech. I Year – II Sem CSE**

**SOFTWARE PROCESS AND PROJECT MANAGEMENT (PE – IV)**

**Course Objectives:**
Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project.
Compare and differentiate organization structures and project structures.
Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.

**UNIT- I**
Software Process Maturity  Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process.  Process Reference Models  Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP.

**UNIT - II**
Software Project Management Renaissance  Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way.  Life-Cycle Phases and Process artifacts  Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model based software architectures

**UNIT - III**
Workflows and Checkpoints of process  Software process workflows, Iteration workflows, Major milestones, Minor milestones, Periodic status assessments. Process Planning Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

**UNIT - IV**
Project Organizations Line-of- business organizations, project organizations, evolution of organizations, process automation.  Project Control and process instrumentation  The seven core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, and metrics automation.

**UNIT - V**
CCPDS-R Case Study and Future Software Project Management Practices  Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

**TEXT BOOKS:**
1. Managing the Software Process, Watts S. Humphrey, Pearson Education.
2. Software Project Management, Walker Royce, Pearson Education.

**REFERENCE BOOKS:**

1. Effective Project Management: Traditional, Agile, Extreme, Robert Wysocki, Sixth edition, Wiley India, rp2011.
2. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000
3. Process Improvement essentials, James R. Persse, O'Reilly, 2006
4. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
5. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
6. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
7. Software Engineering Project Managent, Richard H. Thayer & Edward Yourdon, 2nd edition, Wiley India, 2004.
8. The Art of Project Management, Scott Berkun, SPD, O'Reilly, 2011.
9. Applied Software Project Management, Andrew Stellman & Jennifer Greene, SPD, O'Reilly, rp2011.
10. Agile Project Management, Jim Highsmith, Pearson education, 2004.

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**M. Tech. I Year – II Sem CSE**

**MACHINE LEARNING (PE – IV)**

**Course Objectives:**
To be able to formulate machine learning problems corresponding to different applications.
To understand a range of machine learning algorithms along with their strengths and weaknesses.
To understand the basic theory underlying machine learning.
To be able to apply machine learning algorithms to solve problems of moderate complexity.
To be able to read current research papers and understands the issues raised by current research.

**UNIT - I**
Introduction - Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias

**UNIT - II**
Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning Artificial Neural Networks – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition Advanced topics in artificial neural networks Evaluation Hypotheses – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

**UNIT - III**
Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm Computational learning theory – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning - Instance-Based Learning- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

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

**UNIT – V**
Combining Inductive and Analytical Learning – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators,  Reinforcement Learning – Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

 1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.
4. Machine Learning by Peter Flach , Cambridge.

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**M. Tech. I Year – II Sem CSE**

**INTERNET TECHNOLOGIES AND SERVICES LAB**

**Course Objectives:**
Write syntactically correct HTTP messages and describe the semantics of common HTTP methods and header fields.
Discuss differences between URIs, URNs, and URLs, and demonstrate a detailed understanding of http-scheme URLs, both relative and absolute.
Describe the actions, including those related to the cache, performed by a browser in the process of visiting a Web address.
Install a web server and perform basic administrative procedures, such as tuning communication parameters, denying access to certain domains, and interpreting an access log.
Write a valid standards-conformant HTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms.
Use CSS to implement a variety of presentation effects in HTML and XML documents, including explicit positioning of elements
Demonstrate techniques for improving the accessibility of an HTML document

**List of Sample Problems:**

**i) Internet Technologies**

1. Develop static pages (using Only HTML) of an online Book store. The pages should resemble: www.amazon.com the website should consist the following pages.

Home page, Registration and user Login User Profile Page, Books catalog Shopping Cart, Payment By credit card Order Conformation
2. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
3. Create and save an XML document at the server, which contains 10 users information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
4. Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using Servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
5. Redo the previous task using JSP by converting the static web pages of assignments 2 into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database. Follow the MVC architecture while doing the website.
6. Implement the "Hello World!" program using JSP Struts Framework.

**ii)Additional Assignment Problems**

Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box.

Write a java swing application that takes a text file name as input and counts the characters, words and lines in the file. Words are separated with white space characters and lines are separated with new line character.

Write a simple calculator servlet that takes two numbers and an operator (+, -, /, * and %) from an HTML page and returns the result page with the operation performed on the operands. It should check in a database if the same expression is already computed and if so, just return the value from database. Use MySQL or PostgreSQL.
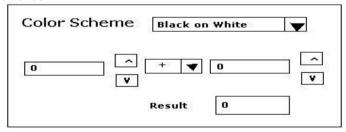
Write an HTML page that contains a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).

Write a servlet that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello <name>, you are not authorized to visit this site" message, where <name> should be replaced with the entered name. Otherwise it should send "Welcome <name> to this site" message.

Write a calculator program in HTML that performs basic arithmetic operations (+, -, /, * and %). Use CSS to change the foreground and background color of the values, buttons and result display area separately. Validate the input strings using JavaScript regular expressions. Handle any special cases like division with zero reasonably.  The screen may look similar to the following:

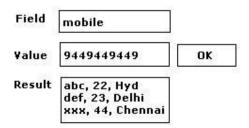**Value 1**    **Operator**                                        **Result**



Write a Java program that creates a calculator GUI, as shown in figure. Extra components may be added for convenience:



The Color Scheme may be Black on White or Blue on Yellow (selectable) and accordingly all components colors must be changed. The values can be either entered or increased or decreased by a step of 10. The operators are +, -, / and * (selectable). Once any change takes place, the result must be automatically computed by the program

Write a Java Application that will read an XML file that contains personal information (Name, Mobile Number, age and place. It reads the information using SAX parser.  After reading the information,  it shows two input Text Fields in a window, one for  tag name and the other for value. Once these two values are given, it should list all the records in the XML file that match the value of the given field in a text area (result box). For example, if the two text boxes are entered with "name" and "ABCD" then it should show all the records for which name is "ABCD"? An Illustration is given below that takes a mobile number and lists all the records that have the same mobile number.



Consider the following web application for implementation:

The user is first served a login page which takes user's name and password. After submitting the details the server checks these values against the data from a database and takes the following decisions.
If name and password matches, serves a welcome page with user's full name.

If name matches and password doesn't match, then serves "password mismatch" page

If name is not found in the database, serves a registration page, where users full name, present user name (used to login) and password are collected. Implement this application in:

1. Pure JSP

2. Pure Servlets

3. Struts Framework

Implement a simple arithmetic calculator with +, -, /, *, % and = operations using Struts Framework The number of times the calculator is used should be displayed at the bottom (use session variable).

### iii)Internet Technologies and Services Lab - Additional Problems

| |
|---|
| Create a web Service in Java that takes two city names from the user and returns the distance between these two from data available from a table in MySql. |
| Write a java and a C# client which use the above service |
| Write a Java program that takes a file as input and encrypts it using DES encryption. The program should check if the file exists and its size is not zero. |
| Write a Java program that generates a key pair and encrypts a given file using RSA algorithm. |
| Write a Java program that finds digest value of a given string. |
| Consider the following xml file for encryption |
| <?xml version="1.0"> <transaction> <from>12345</from> <to>54321</to> <amount>10000</amount> <secretcode>abc123</secretcode> <checksum></checksum> </transaction> |
| Replace <from> and <to> values with the RSA encrypted values represented with base64 encoding assuming that the public key is available in a file in local directory "pubkey.dat". Encrypt <secretcode> with AES algorithm with a password 'secret'. The checksum of all the field values concatenated with a delimiter character '+' will be inserted in the checksum and the xml file is written to encrypted.xml file. |
| Assume that a file 'config.xml', which has the following information: |
| <users> |
| <user> <name>abc</name> <pwd>pwd123</pwd> <role>admin</role> <md5>xxx</md5> </user> <user> <name>def</name> <pwd>pwd123</pwd> <role>guest</role> <md5>xxx</md5> </user> </users> |
| Replace name and role with DES encrypted values and pwd with RSA encrypted values (represent the values with base64 encoding). The public key is available in "public.key" file in current directory. Replace xxx with respective MD5 values of all the fields for each user. Write the resulting file back to config.xml. |

Write an HTML page that gives 3 multiple choice (a,b,c and d) questions from a set of 5 preloaded questions randomly. After each question is answered change the color of the question to either green or blue using CSS. Finally on clicking OK button that is provided, the score should be displayed as a pop-up window. Use Java Script for dynamic content.

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Write an HTML page that has 3 countries on the left side ("USA", "UK" and "INDIA") and on the right side of each country, there is a pull-down menu that contains the following entries: ("Select Answer", "New Delhi", "Washington" and "London"). The user will match the Countries with their respective capitals by selecting an item from the menu. The user chooses all the three answers (whether right or wrong). Then colors of the countries should be changed either to green or to red depending on the answer. Use CSS for changing color.

Write an HTML Page that can be used for registering the candidates for an entrance test. The fields are: name, age, qualifying examination (diploma or 10+2), stream in qualifying examination. If qualifying examination is "diploma", the stream can be "Electrical", "Mechanical" or "Civil". If the qualifying examination is 10+2, the stream can be "MPC" or "BPC". Validate the name to accept only characters and spaces.

Write an HTML page that has two selection menus. The first menu contains the states ("AP", "TN" and "KN") and depending on the selection the second menu should show the following items: "Hyderabad", "Vijayawada", "Kurnool" for AP, "Chennai", "Salem", "Madurai" for TN and "Bangalore", "Bellary", "Mysore" for KN.

Write an HTML page that has phone buttons 0 to 9 and a text box that shows the dialed number. If 00 is pressed at the beginning, it should be replaced with a + symbol in the text box. If the number is not a valid international number (+ followed by country code and 10 digit phone number) the color of the display should be red and it should turn to green when the number is valid. Consider only "+91, +1 and +44 as valid country codes. Use CSS for defining colors.

Write an HTML page that has a text box for phone number or Name. If a number is entered in the box the name should be displayed next to the number. If 00 is pressed at the beginning, it should be replaced with a + symbol in the text box. If a name is entered in the text box, it should show the number next to the name. If the corresponding value is not found, show it in red and show it in green otherwise. Use CSS for colors. Store at least 5 names and numbers in the script for testing.

A library consists of 10 titles and each title has a given number of books initially. A student can take or return a book by entering his/her HTNo as user ID and a given password. If there are at least two books, the book is issued and the balance is modified accordingly.

a) Use RDBMS and implement it with JSP.

b)Use XML File for data and Implement it with JSP

c)Use RDBMS and implement it with Servlets

d)Use XML File for data and Implement it with Servlets

A Bus Reservation System contains the details of a bus seat plan for 40 seats in 2x2 per row arrangement, where the seats are numbered from 1 to 40 from first row to last row. The customer can visit the website and can reserve a ticket of his choice if available by entering his details (Name, Address, Gender and Age). The customer can cancel the ticket by entering the seat number and his name as entered for reservation.

a)Use RDBMS and implement it with JSP.

b)Use XML File for data and Implement it with JSP

c)Use RDBMS and implement it with Servlets

d)Use XML File for data and Implement it with Servlets.

19. Implement a simple messaging system with the following details:

When a student logs in with his/her HTNO and a given password, they should get all the messages posted to him/her giving the ID of sender and the actual message. Each message may be separated with a ruler. There should be a provision for the user to send a message to any number of users by giving the IDs separated with commas in the "To" text box.

   3. Use RDBMS and implement it with JSP.

   4. Use XML File for data and Implement it with JSP

   5. Use RDBMS and implement it with Servlets

   6. Use XML File for data and Implement it with Servlets.

There is an image of 600x100 size which can be logically divided into 12 button areas with labels (0-9, +, =). Write a javascript calculator program that uses this image as input virtual keyboard and three text areas for two input numbers and result of sum of these numbers. Add a CSS that can be used to change the colors of text and background of text areas and the page. The input numbers can be up to 4 digits each.

Develop a web application that takes user name and password as input and compares them with those available in an xml user database. If they match, it should display the welcome page that contains the user's full name and last used date and time retrieved from a client cookie. On logout it stores new time to the cookie and displays a goodbye page. If authentication fails, it should store the attempt number to the client cookie and displays an error page. Add necessary CSS that takes care of the font, color of foreground and background.

A web application has the following specifications:

The first page (Login page) should have a login screen where the user gives the login name and password. Both fields must be validated on client side for a minimum length of 4 characters, name should be lower case a-z characters only and password should contain at least one digit. On submitting these values, the server should validate them with a MySQL database and if failed, show the login page along with a message saying "Login Name or Password Mismatch" in Red color below the main heading and above the form. If successful, show a welcome page with the user's full name (taken from database) and and a link to Logout. On logout, a good bye page is displayed with the total time of usage (Logout time – login time). Specify the Schema details of table and web.xml file contents.

Implement it using (a) JSP Pages (b) Servlets  (c) Struts

Design a struts based web portal for an international conference with following specifications:

The welcome page should give the details of the conference and a link to login. If login fails, direct them back for re-login and also provide a link for registration. On successful registration/login, the user will be directed to a page where s/he can see the status (accepted/rejected) of their already submitted papers followed by a form for submitting a doc file to the conference. Provide a logout button on all pages including the home page, once the user logs in. Implement validation framework to check that the user name is in the form of CCDDCC and password is in the form of (CCSDDD) (C for character, S for special character (one of @, #, $, %, ^, & and !) and D for digit)., Database should be accessed through Connection Pool for MySql for user information. Provide scope for internationalization in future. Assume any missing information and mention it first.

| S. No | Name of the Department | Open Elective (S) Offered for Other Departments | Subject Code |
|---|---|---|---|
| 1. | Civil Engineering (Open Elective – II) | 1. Finite Element Method<br><br>2. Advanced Optimization Techniques and Applications | A32050<br>A32010 |
| 2. | Electronics and Communication Engineering (Open Elective-II) | 1. Industrial Instrumentation<br>2. Principles of Computer Communications and Networks<br>3. Signal Analysis and Condition Monitoring | A32051<br>A32052<br><br>A32011 |
| 4. | Electrical and Electronics Engineering (Open Elective – II) | 1. Energy From Waste<br>2. Distributed Generation and Microgrid<br>3. Reliability Engineering | A32053<br>A32054<br>A32055 |
| 4. | Mechanical Engineering (Open Elective – II) | Engineering Research Methodology | A32056 |
| 5. | Computer Science and Engineering (Open Elective – II) | Machine Learning | A32057 |

# CIVIL ENGINEERING
# FINITE ELEMENT METHOD

## (Open Elective – II)

**Course Objectives:** To impart knowledge about various finite element techniques and development
of finite element code.

**Course Outcome:** The learner will be able to solve continuum problems using finite element analysis.

## UNIT - I

Introduction: Concepts of FEM - steps involved - merits and demerits - energy principles – Discretization - Raleigh - Ritz method of functional approximation. Principles of Elasticity: Stress equations - strain displacement elationships in matrix form plane stress, plane strain and axi-symmetric bodies of revolution with axi-symmetric loading.

## UNIT - II

One dimensional FEM:Stiffness matrix for beam and bar elements - shape functions for 1-D elements. Two dimensional FEM: Different types of elements for plane stress and plane strain analysis - displacement models - generalized coordinates - shape functions - convergent and compatibility requirements - geometric invariance - natural coordinate system - area and volume coordinates - generation of element stiffness and nodal load matrices

## UNIT - III

Isoparametric formulation:Concept - different isoparametric elements for 2D analysis - formulation of 4-noded and 8-noded isoparametric quadrilateral elements - Lagrange elements - serendipity elements. Axi Symmetric Analysis:bodies of revolution - axi symmetric modeling - strain displacement relationship - formulation of axi symmetric elements. Three dimensional FEM:Different 3-D elements-strain-displacement relationship –formulation of hexahedral and isoparametric solid element.

## UNIT - IV

Introduction to Finite Element Analysis of Plates:Basic theory of plate bending - thin plate theory - stress resultants - Mindlin's approximations - formulation of 4-noded isoperimetric quadrilateral plate element – Shell Element.

## UNIT - V

Introduction to non – linear finite analysis – basic methods – application to Special structures.

**TEXT BOOKS:**

**1.** A First Course in a Finite Element by Daryl L .Logan, CL Engineers.

2. Concepts and Applications of Finite Element Analysis by Robert D.Cook, DavidS. Malkus and Michael E. Plesha, John Wiley & Sons.

**REFERENCES:**

1. Introduction to Finite element Method by Tirupathi Chandra Patla and Belugunudu

2. Finite element Methods by OC Zienkiewicz

3. Finite element analysis, theory and progarmming by GS Krishna Murthy.

4. Introduction to Finite element Method by JN Reddy

**ADVANCED OPTIMIZATION TECHNIQUES AND APPLICATIONS**
**(Open Elective – II)**

**UNIT- I**
**SINGLE VARIABLE NON-LINEAR UNCONSTRAINED OPTIMITION:** One dimensional Optimization methods:- Uni-modal function, elimination method, Fibonacci method, golden section method,i nterpolation methods- quadratic & cubic interpolation methods.

**UNIT – II**
**MULTI VARIABLE NON-LINEAR UNCONSTRAINED OPTIMIZATION:** Direct search method – Univariant Method – pattern search methods – Powell's – Hook – Jeeves, Rosenbrock search methods – gradient methods, gradient of function, steepest decent method, Fletcher reeves method. Variable metric method.

**UNIT – III**
**GEOMETRIC PROGRAMMING:** Polynomials – arithmetic – geometric inequality – unconstrained G.P – constrained G.P
**DYNAMIC PROGRAMMING:** Multistage decision process, principles of optimality, examples, conversion of final problem to an initial value problem, application of dynamic programming, production inventory. Allocation, scheduling replacement.

**UNIT IV**
**LINEAR PROGRAMMING: formulation** – Sensivity analysis. Change in the constraints, cost coefficients , coefficients of the constraints, addition and deletion of variable, constraints. Simulation – Introduction – Types – Steps – application – inventory – queuing – thermal system.

**UNIT V**
**INTEGER PROGRAMMING**: Introduction – formulation – Gomory cutting plane algorithm – Zero or one algorithm, branch and bound method.
**STOCHASTIC PROGRAMMING:** Basic concepts of probability theory, random variables – distributions – mean, variance, Correlation, co variance, joint probability distribution – stochastic linear, dynamic programming.

**REFERENCES:**
1. Optimization theory & Applications/ S.S Rao/ New Age International
2. Introductory to operation research/Kasan & Kumar/Springar
3. Optimization Techniques theory and practice / M.C Joshi, K.M Moudgalya/ Narosa Publications.
4. Operation Research/H.A. Taha/TMH
5. Optimization in operations research/R.L Rardin
6. Optimization Techniques/Benugundu & Chandraputla/Person Asia

# ELECTRONICS AND COMMUNICATION ENGINEERING
## INDUSTRIAL INSTRUMENTATION
### (Open Elective – II)

## UNIT – I

**METROLOGY, VELOCITY AND ACCELERATION MEASUREMENT:** Measurement of length - Gauge blocks – Plainness – Area using Simpson's rule, Plain meter – Diameter – Roughness – Angle using Bevel protractor, sine bars and Clinometer – Mechanical, Electrical, Optical and Pneumatic Comparators. Optical Methods for length and distance measurements using Optical flats and Michelson Interferometer. Relative velocity – Translational and Rotational velocity measurements – Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods. Accelerometers-different types, Gyroscopes-applications.

## UNIT – II

**FORCE AND PRESSURE MEASUREMENT:** Force measurement – Different methods – Gyroscopic
Force Measurement – Vibrating wire Force transducer. Basics of Pressure measurement – Manometer types – Force-Balance and Vibrating Cylinder Transducers – High and Low Pressure measurement – McLeod Gauge, Knudsen Gauge, Momentum Transfer Gauge, Thermal Conductivity Gauge, Ionization Gauge, Dual Gauge Techniques, Deadweight Gauges, Hydrostatic Pressure Measurement

## UNIT – III

**FLOW MEASUREMENT AND LEVEL MEASUREMENT:** Flow Meters- Head type, Area type (Rota
meter), electromagnetic type, Positive displacement type, mass flow meter, ultrasonic type, vertex shedding type, Hotwire anemometer type, Laser Doppler Velocity-meter. Basic Level measurements – Direct, Indirect, Pressure, Buoyancy, Weight, Capacitive Probe methods

## UNIT – IV

**DENSITY, VISCOSITY AND OTHER MEASUREMENTS:** Density measurements – Strain Gauge load cell method – Buoyancy method - Air pressure balance method – Gamma ray method – Vibrating probe method. Units of Viscosity, specific gravity scales used in Petroleum Industries, Different Methods of measuring consistency and Viscosity –Two float viscorator –Industrial consistency meter. Sound-Level Meters, Microphones, Humidity Measurement

## UNIT – V

**CALIBRATION AND INTERFACING:** Calibration using Master Sensors, Interfacing of Force, Pressure, Velocity, Acceleration, Flow, Density and Viscosity Sensors, Variable Frequency Drive

**TEXT BOOKS:**

1. Doeblin E.O., "Measurement Systems – Applications and Design", 4th Edition, McGraw Hill International, 1990.
2. Patranabis D, "Principles of Industrial Instrumentation", TMH. End edition 1997

**REFERENCES:**

1. Considine D. M., "Process Instruments and Control Handbook", 4th Edition, McGraw Hill International, 1993
2. Jain R.K., "Mechanical and Industrial Measurements", Khanna Publications.

# ELECTRONICS AND COMMUNICATION ENGINEERING
## PRINCIPLES OF COMPUTER COMMUNICATIONS AND NETWORKS
### (Open Elective – II)

**Prerequisite:** Nil

**Course Objectives:**
- To understand the concept of computer communication.
- To learn about the networking concept, layered protocols.
- To understand various communications concepts.
- To get the knowledge of various networking equipment.

**Course Outcomes:** The student:
- Can get the knowledge of networking of computers, data transmission between computers.
- Will have the exposure about the various communication concepts.
- Will get awareness about the structure and equipment of computer network structures.

## 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.

**ANURAG GROUP OF INSTITUTIONS**
**M. Tech I Year – II Sem.**

**SIGNAL ANALYSIS AND CONDITION MONITORING**
**(OPEN ELECTIVE – II)**

**UNIT-I**
**Introduction,** Basic concepts. Fourier analysis. Bandwidth. Signal types. Convolution. Signal analysis: Filter response time. Detectors. Recorders. Analog analyzer types.

**UNIT-II**
**PRACTICAL ANALYSIS OF STATIONARY SIGNALS:** Stepped filter analysis. Swept filter analysis. High speed analysis. Real-time analysis.

**UNIT-III**
**PRACTICAL ANALYSIS OF CONTINUOUS NON-STATIONARY SIGNALS**: Choice of window type. Choice of window length. Choice of incremental step. Practical details. Scaling of the results.

**UNIT-IV**
**PRACTICAL ANALYSIS OF TRANSIENTS**: Analysis as a periodic signal. Analysis by repeated playback (constant bandwidth). Analysis by repeated playback (variable bandwidth).

**UNIT-V**
**CONDITION MONITORING IN REAL SYSTEMS**: Diagnostic tools. Condition monitoring of two stage compressor. Cement mill foundation. I.D. fan. Sugar centrifugal. Cooling tower fan. Air separator. Preheater fan. Field balancing of rotors. ISO standards on vibrations.

**REFERENCES:**
1. Condition Monitoring of Mechanical Systems / Kolacat.
2. Frequency Analysis /R.B.Randall.
3. Mechanical Vibrations Practice with Basic Theory / V. Ramamurti/ Narosa Publishing House.
4. Theory of Machines and Mechanisms/ Amitabh Ghosh & AK Malik/ EWP

## ELECTRICAL AND ELECTRONICS ENGINEERING
## ENERGY FROM WASTE
### (Open Elective – II)

**Prerequisite:** Renewable Energy Sources, Physics, Environmental Studies

**Course Objectives**:
- To classify solid waste sources
- To identify methods of solid waste disposal
- To study various energy generation methods
- To analyse biogas production methods and recycling of e-waste

**Course Outcomes**: Upon the completion of the subject, the student will be able to
- Understand technologies for generation of energy from solid waste
- Compare methods of solid waste disposal
- Identify sources of energy from bio-chemical conversion
- Analyze methods for management of e-waste

## UNIT- I

Solid Waste Sources Solid Waste Sources, types, composition, Properties, Global warming, Municipal Solid Waste: Physical, chemical and biological properties , Waste Collection and, Transfer stations, Waste minimization and recycling of municipal waste, Segregation of waste, Size Reduction , Managing Waste. Status of technologies for generation of Energy from Waste Treatment and Disposal Aerobic composting, incineration, Furnace type and design, Medical waste /Pharmaceutical waste treatment Technologies, incineration, Environmental impacts, Measures to mitigate environmental effects due to incineration .

## UNIT – II

Land Fill method of Solid waste disposal Land fill classification, Types, methods and Sitting consideration, Layout and preliminary design of landfills: Composition, characteristics, generation, Movement and control of landfill leach ate and gases, Environmental monitoring system for land fill gases.

## UNIT – III

Energy Generation from Waste Bio-chemical Conversion: Sources of energy generation, anaerobic digestion of sewage and municipal wastes, direct combustion of MSW-refuse derived solid fuel, Industrial waste, agro residues, Anaerobic Digestion.

## UNIT – IV

Biogas production, Land fill gas generation and utilization, Thermo-chemical conversion: Sources of energy generation, Gasification of waste using Gasifiers, Briquetting, Utilization and advantages of briquetting, Environmental benefits of Bio-chemical and Thermo- chemical conversion.

## UNIT – V

E-waste: e-waste in the global context – Growth of Electrical and Electronics Industry in India – Environmental concerns and health hazards – Recycling e-waste: a thriving economy of the unorganized sector – Global trade in hazardous waste – impact of hazardous e-waste in India. Management of e-waste: e-waste legislation, Government regulations on e-waste management – International experience – need for stringent health safeguards and environmental protection laws of India.

**TEXT BOOKS:**

1. Nicholas P. Cheremisinoff. Handbook of Solid Waste Management and Waste Minimization Technologies. An Imprint of Elsevier, New Delhi (2003).
2. P. Aarne Vesilind, William A. Worrell and Debra R. Reinhart. Solid Waste Engineering. Thomson Asia Pte Ltd. Singapore (2002)
3. M. Dutta , B. P. Parida, B. K. Guha and T. R. Surkrishnan. Industrial Solid Waste Management and Landfilling practice. Narosa Publishing House, New Delhi (1999).
4. "E-waste in India: Research unit, Rajya Sabha Secretariat, New Delhi, June 2011"
5. Amalendu Bagchi. Design, construction and Monitoring of Landfills. John Wiley and Sons. New York. (1994)
6. M. L. Davis and D. A. Cornwell. Introduction to environmental engineering. Mc Graw Hill International Edition, Singapore (2008)
7. C. S. Rao. Environmental Pollution Control Engineering. Wiley Eastern Ltd. New Delhi (1995)
8. S. K. Agarwal. Industrial Environment Assessment and Strategy. APH Publishing Corporation. New Delhi (!996)
9. Sofer, Samir S. (ed.), Zaborsky, R. (ed.), "Biomass Conversion Processes for Energy and Fuels", New York, Plenum Press, 1981
10. Hagerty, D.Joseph; Pavoni, Joseph L; Heer, John E., "Solid Waste Management", New York, Van Nostrand, 1973
11. George Tchobanoglous, Hilary Theisen and Samuel Vigil Prsl: Tchobanoglous, George Theisen, Hillary Vigil, Samuel, "Integrated Solid Waste management: Engineering Principles and Management issues", New York, McGraw Hill, 1993.

**REFERENCES:**

1. C Parker and T Roberts (Ed), Energy from Waste - An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985
2. KL Shah, Basics of Solid and Hazardous Waste Management Technology, Prentice Hall, 2000
3. M Datta, Waste Disposal in Engineered Landfills, Narosa Publishing House, 1997
4. G Rich et.al, Hazardous Waste Management Technology, Podvan Publishers, 1987
5. AD Bhide, BB Sundaresan, Solid Waste Management in Developing Countries, INSDOC, New Delhi,1983 FUEL CELL AND

**DISTRIBUTED GENERATION AND MICROGRID**
**(Open Elective – II)**

**Course Objectives**

- To illustrate the concept of distributed generation
- To analyze the impact of grid integration.
- To study concept of Micro grid and its configuration
- To find optimal size, placement and control aspects of DGs

**Course Outcomes:** Upon the Completion of the course student will be able to

- Find the size and optimal placement DG
- Analyze the impact of grid integration and control aspects of DGs
- Model and analyze a micro grid taking into consideration the planning and operational issues of the DGs to be connected in the system.
- Describe the technical impacts of DGs in power systems

## UNIT – I

Need for distributed generation - Renewable sources in distributed generation - Current scenario in distributed generation - Planning of DGs – Siting and sizing of DGs – Optimal placement of DG sources in distribution systems.

## UNIT – II

Grid integration of DGs – Different types of interfaces - Inverter based DGs and rotating machine based interfaces - Aggregation of multiple DG units - Energy storage elements - Batteries, ultracapacitors, flywheels.

## UNIT – III

Technical impacts of DGs – Transmission systems, Distribution systems, De-regulation – Impact of DGs upon protective relaying – Impact of DGs upon transient and dynamic stability of existing distribution systems.

## UNIT-IV

Economic and control aspects of DGs – Market facts, issues and challenges - Limitations of DGs - Voltage control techniques, Reactive power control, Harmonics, Power quality issues - Reliability of DG based systems – Steady state and Dynamic analysis.

## UNIT – V

Introduction to micro-grids – Types of micro-grids – Autonomous and non-autonomous grids – Sizing of micro-grids - Modeling & analysis - Micro-grids with multiple DGs – Micro-grids with power electronic interfacing units - Transients in micro-grids - Protection of micro-grids – Case studies.

**TEXT BOOKS:**

1. H. Lee Willis, Walter G. Scott , 'Distributed Power Generation – Planning and Evaluation', Marcel Decker Press, 2000.
2. M.Godoy Simoes, Felix A.Farret, 'Renewable Energy Systems – Design and Analysis with Induction Generators', CRC press.
3. Robert Lasseter, Paolo Piagi, ' Micro-grid: A Conceptual Solution', PESC 2004, June 2004.
4. F. Katiraei, M.R. Iravani, 'Transients of a Micro-Grid System with Multiple Distributed Energy Resources', International Conference on Power Systems Transients (IPST'05) in Montreal, Canada on June 19-23, 2005.
5. Z. Ye, R. Walling, N. Miller, P. Du, K. Nelson, 'Facility Microgrids', General Electric Global Research Center, Niskayuna, New York, Subcontract report, May 2005.

## ELECTRICAL AND ELECTRONICS ENGINEERING
## RELIABILITY ENGINEERING
### (Open Elective – II)

**Course Objectives:**

- To comprehend the concept of Reliability and Unreliability
- Derive the expressions for probability of failure, Expected value and standard deviation of Binominal distribution, Poisson distribution, normal distribution and weibull distributions.
- Formulating expressions for Reliability analysis of series-parallel and Non-series parallel systems
- Deriving expressions for Time dependent and Limiting State Probabilities using Markov models.

**Course Outcomes:** Upon the completion of this course, the student will be able to
- Apply fundamental knowledge of Reliability to modeling and analysis of seriesparallel and Non-series parallel systems.
- Solve some practical problems related with Generation, Transmission and Utilization of Electrical Energy.
- Understand or become aware of various failures, causes of failures and remedies for failures in practical systems.

## UNIT – I

Rules for combining probabilities of events, Definition of Reliability. Significance of the terms appearing in the definition. Probability distributions: Random variables, probability density and distribution functions. Mathematical expectation, Binominal distribution, Poisson distribution, normal distribution, weibull distribution.

## UNIT – II

Hazard rate, derivation of the reliability function in terms of the hazard rate. Failures: Causes of failures, types of failures (early failures, chance failures and wear-out failures). Bath tub curve. Preventive and corrective maintenance. Modes of failure. Measures of reliability: mean time to failure and mean time between failures.

## UNIT – III

Classification of engineering systems: series, parallel and series-parallel systems- Expressions for the reliability of the basic configurations. Reliability evaluation of Non-series-parallel configurations: Decomposition, Path based and cutest based methods, Deduction of the Paths and cutsets from Event tree.

**UNIT – IV**

Discrete Markov Chains: General modeling concepts, stochastic transitional probability matrix, time dependent probability evaluation and limiting state probability evaluation of one component repairable model. Absorbing states. Continuous Markov Processes: Modeling concepts, State space diagrams, Stochastic Transitional Probability Matrix, Evaluating time dependent and limiting state Probabilities of one component repairable model. Evaluation of Limiting state probabilities of two component repairable model.

**UNIT – V**

Approximate system Reliability analysis of Series systems, parallel systems with two and more than two components, Network reduction techniques. Minimal cutest/failure mode approach.

**TEXT BOOKS:**
1. "Reliability evaluation of Engineering systems", Roy Billinton and Ronald N Allan, BS Publications.
2. "Reliability Engineering", Elsayed A. Elsayed, Prentice Hall Publications.

**REFERENCES:**
1. "Reliability Engineering: Theory and Practice", By Alessandro Birolini, Springer Publications.
2. "An Introduction to Reliability and Maintainability Engineering", Charles Ebeling, TMH Publications.
3. "Reliability Engineering", E. Balaguruswamy, TMH Publications.

## MECHANICAL ENGINEERING
## ENGINEERING RESEARCH METHODOLOGY
### (Open Elective – II)

**UNIT – I**

**Research Methodology:** Objectives and Motivation of Research, Types of Research,Research Approaches, Significance of Research, Research Methods verses Methodology, Research and Scientific Method, Important of Research Methodology, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India, Benefits to the society in general.

**Defining the Research Problem:** Definition of Research Problem, Problem Formulation, Necessity of Defining the Problem, Technique involved in Defining a Problem.

**UNIT – II**

**Literature Survey**: Importance of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Information through Internet. **Literature Review**: Need of Review, Guidelines for Review, Record of Research Review.

**UNIT – III**

**Research Design:** Meaning of Research Design, Need of Research Design, Feature of a Good Design Important Concepts Related to Research Design, Different Research Designs, Basic Principles of Experimental Design, Developing a Research Plan, Design of Experimental Set-up, Use of Standards and Codes.

**UNIT – IV**

**Data Collection**: Collection of primary data, Secondary data, Data organization, Methods of data grouping, Diagrammatic representation of data, Graphic representation of data. Sample Design, Need for sampling, some important sampling definitions, Estimation of population, Role of Statistics for Data Analysis, Parametric V/s Non Parametric methods, Descriptive Statistics, Measures of central tendency and Dispersion, Hypothesis testing, Use of Statistical software.
**Data Analysis:** Deterministic and random data, Uncertainty analysis, Tests for significance: Chisquare, student's t-test, Regression modeling, Direct and Interaction effects, ANOVA, F-test, Time Series analysis, Autocorrelation and Autoregressive modeling.

**UNIT – V**

**Research Report Writing**: Format of the Research report, Synopsis, Dissertation, Thesis its Differentiation, References/Bibliography/Webliography, Technical paper writing/Journal report writing, making presentation, Use of visual aids. **Research Proposal Preparation**: Writing a Research Proposal and Research Report, Writing Research Grant Proposal.

**REFERENCES:**
1. C.R Kothari, Research Methodology, Methods & Technique; New Age International Publishers, 2004
2. R. Ganesan, Research Methodology for Engineers, MJP Publishers, 2011
3. Ratan Khananabis and Suvasis Saha, Research Methodology, Universities Press, Hyderabad, 2015.
4. Y. P. Agarwal, Statistical Methods: Concepts, Application and Computation, Sterling Publs.,Pvt., Ltd., New Delhi, 2004
5. Vijay Upagade and Aravind Shende, Research Methodology, S. Chand & Company Ltd.,New Delhi, 2009
6. G. Nageswara Rao, Research Methodology and Quantitative methods, BS Publications,Hyderabad, 2012.
7. Naval Bajjai "Business Research Methods" Pearson 2011.
8. Prahalad Mishra " Business Research Methods " Oxford 2016

**MACHINE LEARNING**
**(Open Elective - II)**

**Prerequisites:**
- Data Structures
- Knowledge on statistical methods

**Course Objectives:**
- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

**Course Outcomes:**
- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

## UNIT – I

**Introduction** - Well-posed learning problems, designing a learning system Perspectives and issues in machine learning
**Concept learning and the general to specific ordering** – Introduction, A concept learning task, concept learning as search, Find-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination algorithm, Remarks on Version Spaces and Candidate Elimination, Inductive Bias.
**Decision Tree Learning** – Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

## UNIT – II

**Artificial Neural Networks** Introduction, Neural Network Representation, Appropriate Problems for Neural Network Learning, Perceptions, Multilayer Networks and the Back propagation Algorithm. Discussion on the Back Propagation Algorithm, An illustrative Example: Face Recognition **Evaluation Hypotheses** – Motivation, Estimation Hypothesis Accuracy, Basics of Sampling Theory, A General Approach for Deriving Confidence Intervals, Difference in Error of Two Hypotheses, Comparing Learning Algorithms.

## UNIT – III

**Bayesian learning -** Introduction, Bayes Theorem, Bayes Theorem and Concept Learning Maximum Likelihood and Least Squared Error Hypotheses, Maximum Likelihood Hypotheses for Predicting Probabilities, Minimum Description Length Principle , Bayes Optimal Classifier, Gibs Algorithm, Naïve Bayes Classifier, An Example: Learning to Classify Text, Bayesian Belief Networks, EM Algorithm.
**Computational Learning Theory –** Introduction, Probably Learning an Approximately Correct Hypothesis, Sample Complexity for Finite Hypothesis Space, Sample Complexity for Infinite Hypothesis Spaces, The Mistake Bound Model of Learning.
**Instance-Based Learning –** Introduction, k-Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.


## UNIT – IV

**Pattern Comparison Techniques**, Temporal patterns, Dynamic Time Warping Methods, Clustering, Codebook Generation, Vector Quantization

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

## UNIT – V

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

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


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

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