Vision
To provide congenial academic environment for individuals to develop and blossom as academically superior, nationally responsible and socially conscious citizens.

Mission
- To impart high quality computer knowledge to the students by conducting education programmes.
- To provide exposure to the students about the emerging technological advancements for meeting the demands of the industry
- To advance discipline of computing through internationally recognized research and development
- To foster an environment that promotes extension activities and continuing education

M. E. (CSE) - PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

1. The broad knowledge of computer science serving as a foundation for on-going lifelong learning, and have demonstrated some success early in their professional careers and/or in the pursuit of post graduate studies

2. The creative and critical reasoning skills and are solving technical problems, ethically and responsibly, in service to society.

3. The mathematical and scientific knowledge and are solving emerging real-world problems related to programming, networking, information security, image analysis, and advanced computing systems, and are demonstrating that they possess the necessary communication, organization and teamwork skills for the execution of complex technological solutions

4. The necessary communication skills to bridge the divide between advanced technology and end users in the practice of computer science
M.E. (CSE) – PROGRAMME OUTCOMES (PO)

On successful completion of the Post Graduating course, the Computer Science and Engineering students will demonstrate:

1. **ANALYTICAL SKILLS:** Narrate familiarity in the knowledge of computing, mathematical concepts, algorithmic principles in computer science and engineering theory to fabricate computer based systems of varying complexity.

2. **RETRIEVAL SKILLS:** Analyze, generate, and interpret data to choose relevant procedures, resources and contemporary tools in computer science and engineering considering current and future trends.

3. **CREATIVE SKILLS:** Investigate and devise a computer based system to meet the necessary requirements within the realistic constraints such as economic, environmental, societal, ethical, safety and sustainability in the field of computer science and engineering.

4. **TEAM WORK AND PROFESSIONAL INTEGRITY:** Effectively function as a leader in multi-disciplinary teams and entrust on professional responsibilities to achieve a common objective.

5. **SPEAKING / WRITING SKILLS:** Correspond efficiently on intricate computing problems with all type of audiences and engrave valuable reports, documentation and oral presentations.

6. **ASSESSMENT SKILLS:** Broad analyzing capability on local and global impact of computing on individuals, organizations and society.

7. **SOCIAL AND CONTINUING EDUCATION PERCEPTION:** Express capability for sustainable professional development and life-long learning with a knowledge of contemporary issues for the growth of computer science and engineering field.

8. **CAREER AND IMMEDIATE EMPLOYMENT:** Recognize the significance of proficient perfection by pursuing studies to face competitive examinations and the ability to propose innovative methods in research for real-life problems that offer demanding and gratifying careers in computing.
### M.E. (CSE) – MAPPING OF PO WITH PEO

#### Mapping PO with PEO

<table>
<thead>
<tr>
<th>POs</th>
<th>PEO1</th>
<th>PEO2</th>
<th>PEO3</th>
<th>PEO4</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PO2</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PO3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>PO4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>PO5</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>PO6</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>PO7</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>PO8</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>
1. **Condition for Admission**
Candidates for admission to the first year of the four-semester **M.E / M.Tech Degree programme in Engineering** shall be required to have passed B.E / B.Tech degree of Annamalai University or any other authority accepted by the syndicate of this University as equivalent thereto. They shall satisfy the condition regarding qualifying marks and physical fitness as may be prescribed by the syndicate of the Annamalai University from time to time. The admission for part time programme is restricted to those working or residing within a radius of 90 km from Annamalainagar. The application should be sent through their employers.

2. **Branches of Study in M.E / M.Tech**
The Branch and Eligibility criteria of programmes are given in **Annexure 1**

3. **Courses of study**
The courses of study and the respective syllabi for each of the M.E / M. Tech programmes offered by the different Departments of study are given separately.

4. **Scheme of Examinations**
The scheme of Examinations is given separately.

5. **Choice Based Credit System (CBCS)**
The curriculum includes three components namely Professional Core, Professional Electives and Open Electives in addition to Thesis. Each semester curriculum shall normally have a blend of theory and practical courses.

6. **Assignment of Credits for Courses**
Each course is normally assigned one credit per hour of lecture / tutorial per week and one credit for two hours or part thereof for laboratory or practical per week. The total credits for the programme will be 65.

7. **Duration of the programme**
A student of **M.E / M.Tech** programme is normally expected to complete in four semesters for full-time / six semesters for part-time but in any case not more than four years for full-time / six years for part-time from the date of admission.

8. **Registration for courses**
A newly admitted student will automatically be registered for all the courses prescribed for the first semester, without any option. Every other student shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration with the approval of the Dean on the recommendation of the Head
of the Department along with a late fee will be done up to the last working day. Registration for the Thesis Phase - I and II shall be done at the appropriate semesters.

9. Electives
The student has to select two electives in first semester and another two electives in the second semester from the list of Professional Electives. The student has to select two electives in third semester from the list of Open Electives offered by the department/ allied department. A student may be allowed to take up the open elective courses of third semester (Full Time program) in the first and second semester, one course in each of the semesters to enable them to carry out thesis in an industry during the entire second year of study provided they should register those courses in the first semester itself. Such students should meet the teachers offering those elective courses themselves for clarifications. No specific slots will be allotted in the time table for such courses.

Further, the two open elective courses to be studied in III semester (Full Time programme) may also be credited through the SWAYAM portal of UGC with the approval of Head of the Department concerned. In such a case, the courses must be credited before the end of III Semester.

10. Assessment
The break-up of continuous assessment and examination marks for theory courses is as follows:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>First assessment (Mid-Semester Test-I)</td>
<td>10</td>
</tr>
<tr>
<td>Second assessment (Mid-Semester Test-II)</td>
<td>10</td>
</tr>
<tr>
<td>Third Assessment</td>
<td>5</td>
</tr>
<tr>
<td>End Semester Examination</td>
<td>75</td>
</tr>
</tbody>
</table>

The break-up of continuous assessment and examination marks for Practical courses is as follows:

<table>
<thead>
<tr>
<th>Assessment Type</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>First assessment (Test-I)</td>
<td>15</td>
</tr>
<tr>
<td>Second assessment (Test-II)</td>
<td>15</td>
</tr>
<tr>
<td>Maintenance of record book</td>
<td>10</td>
</tr>
<tr>
<td>End Semester Examination</td>
<td>60</td>
</tr>
</tbody>
</table>

The thesis Phase I will be assessed for 40 marks by a committee consisting of the Head of the Department, the guide and a minimum of two members nominated by the Head of the Department. The Head of the Department will be the chairman. The number of reviews must be a minimum of three per semester. 60 marks are allotted for the thesis work and viva voce examination at the end of the third semester. The same procedure will be adopted for thesis Phase II in the fourth semester.

11. Student Counsellors (Mentors)
To help the students in planning their course of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counsellor for those students throughout their period of study. Such student counsellors shall advise the students, give preliminary approval for the courses to be taken by the students during each semester,
monitor their progress in SWAYAM courses / open elective courses and obtain the final approval of the Head of the Department.

12. Class Committee

For each of the semesters of M.E / M.Tech programmes, separate class committees will be constituted by the respective Head of the Departments. The composition of the class committees from first to fourth semesters for Full time and first to sixth semesters for Part-time will be as follows:

- Teachers of the individual courses.
- A Thesis coordinator (for Thesis Phase I and II) shall be appointed by the Head of the Department from among the Thesis supervisors.
- A thesis review committee chairman shall be appointed by the Head of the Department.
- One Professor or Associate Professor, preferably not teaching the concerned class, appointed as Chairman by the Head of the Department.
- The Head of the Department may opt to be a member or the Chairman.
- All counselors of the class and the Head of the Department (if not already a member) or any staff member nominated by the Head of the Department may opt to be special invitees.

The class committee shall meet three times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of assessment like test, assignment etc. for the third assessment and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The third meeting will be held after all the assessments but before the University semester examinations are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 25 marks for theory / 40 marks for practical and project work will be finalized for every student and tabulated and submitted to the Head of the Department for approval and transmission to the Controller of Examinations.

13. Temporary Break Of Study

A student can take a one-time temporary break of study covering the current semester and / or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid-semester test. However, the student must complete the entire programme within the maximum period of four years for Full time / six years for Part time.

14. Substitute Assessments

A student who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the end of semester examination may take a
substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the date of the third meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Head of the Department within a week from the date of the missed assessment.

15. Attendance Requirements

The students with 75% attendance and above are permitted to appear for the University examinations. However, the Vice Chancellor may give a rebate / concession not exceeding 10% in attendance for exceptional cases only on Medical Grounds.

A student who withdraws from or does not meet the minimum attendance requirement in a semester must re-register and repeat the same semester in the subsequent academic years.

16. Passing and declaration of Examination Results

All assessments of all the courses on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average (GPA) and cumulative grade point average (CGPA) and prepare the mark sheets.

<table>
<thead>
<tr>
<th>Marks</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 to 100</td>
<td>‘S’</td>
</tr>
<tr>
<td>80 to 89</td>
<td>‘A’</td>
</tr>
<tr>
<td>70 to 79</td>
<td>‘B’</td>
</tr>
<tr>
<td>60 to 69</td>
<td>‘C’</td>
</tr>
<tr>
<td>55 to 59</td>
<td>‘D’</td>
</tr>
<tr>
<td>50 to 54</td>
<td>‘E’</td>
</tr>
<tr>
<td>Less than 50</td>
<td>‘RA’</td>
</tr>
<tr>
<td>Withdrawn from the Examination</td>
<td>‘W’</td>
</tr>
</tbody>
</table>

A student who obtains less than 30 / 24 marks out of 75 / 60 in the theory / practical examinations respectively or is absent for the examination will be awarded grade RA.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course and earned the credits for that course. Such a course cannot be repeated by the student.

A student who obtains letter grade RA / W in the mark sheet must reappear for the examination of the courses.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

- S - 10
- A - 9
- B - 8
- C - 7
- D - 6
- E - 5
- RA - 0

Courses with grade RA / W are not considered for calculation of grade point average or cumulative grade point average.

A student can apply for re-totaling of one or more of his examination answer papers within a week from the date of issue of mark sheet to the student on payment of the
prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After the results are declared, mark sheets will be issued to the students. The mark sheet will contain the list of courses registered during the semester, the grades scored and the grade point average for the semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the semester, divided by the sum of the number of credits for all courses taken in that semester.

CGPA is similarly calculated considering all the courses taken from the time of admission.

17. Awarding Degree
After successful completion of the programme, the degree will be awarded with the following classifications based on CGPA.
For First Class with Distinction the student must earn a minimum of 65 credits within four semesters for full-time / six semesters for Part time from the time of admission, pass all the courses in the first attempt and obtain a CGPA of 8.25 or above.
For First Class, the student must earn a minimum of 65 credits within two years and six months for full-time / three years and six months for Part time from the time of admission and obtain a CGPA of 6.75 or above.
For Second class, the student must earn a minimum of 65 credits within four years for full-time / six years for Part time from the time of admission.

18. Ranking Of Candidates
The candidates who are eligible to get the M.E / M.Tech degree in First Class with Distinction will be ranked on the basis of CGPA for all the courses of study from I to IV semester for M.E / M.Tech full-time / I to VI semester for M.E / M.Tech part-time.
The candidates passing with First Class and without failing in any subject from the time of admission will be ranked next to those with distinction on the basis of CGPA for all the courses of study from I to IV semester for full-time / I to VI semester for M.E / M.Tech part-time.

19. Transitory Regulations
If a candidate studying under the old regulations M.E. / M.Tech could not attend any of the courses in his/her courses, shall be permitted to attend equal number of courses, under the new regulation and will be examined on those subjects. The choice of courses will be decided by the concerned Head of the department. However he/she will be permitted to submit the thesis as per the old regulations. The results of such candidates will be passed as per old regulations.
The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the courses of study and the syllabi from time to time.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Department</th>
<th>Programme (Full Time &amp; Part time)</th>
<th>Eligible B.E./B.Tech Programme *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ii. Environmental Engineering &amp; Management</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii. Construction Engg. and Management</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii. Geotechnical Engineering</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>iv. Disaster Management &amp; Engg.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii. Welding Engineering</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii. Power System</td>
<td>B.E. / B.Tech – Electrical and Electronics Engg,</td>
</tr>
</tbody>
</table>

8
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Department</th>
<th>Programme (Full Time &amp; Part time)</th>
<th>Eligible B.E/B.Tech Programme *</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Chemical Engineering</td>
<td>i. Chemical Engineering</td>
<td>B.E. / B.Tech – Chemical Engg, Petroleum Engg, Petrochemical Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii. Industrial Bio Technology</td>
<td>B.E. / B.Tech - Chemical Engg, Food Technology, Biotechnology, Leather Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>iv. Industrial Safety Engineering</td>
<td>B.E. / B.Tech – Any Branch of Engineering</td>
</tr>
</tbody>
</table>

* AMIE in the relevant discipline is considered equivalent to B.E
# DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
## Curriculum for M.E. (COMPUTER SCIENCE & ENGINEERING)

### Full-Time

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Category</th>
<th>Course Code</th>
<th>Course</th>
<th>L</th>
<th>P</th>
<th>T</th>
<th>CA</th>
<th>FE</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Semester – I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PC-I</td>
<td>CSEC 101</td>
<td>Mathematics for Computing</td>
<td>4</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>PC-II</td>
<td>CSEC 102</td>
<td>Advanced Algorithm and Data Structures</td>
<td>4</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>PC-III</td>
<td>CSEC 103</td>
<td>Computer Network Engineering and Management</td>
<td>4</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>PC-IV</td>
<td>CSEC 104</td>
<td>Graphics and Computer Vision</td>
<td>4</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>PE-I</td>
<td>CSEE 105</td>
<td>Professional Elective – I</td>
<td>4</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>PE-II</td>
<td>CSEE 106</td>
<td>Professional Elective – II</td>
<td>4</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>PC Lab-I</td>
<td>CSEP 107</td>
<td>Data Structures and Graphics using C++ Lab</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>24</td>
<td>3</td>
<td>190</td>
<td>510</td>
<td>700</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Semester – II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PC-V</td>
<td>CSEC 201</td>
<td>Database Organization and Design</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>PC-VI</td>
<td>CSEC 202</td>
<td>Operating System Design</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>PC-VII</td>
<td>CSEC 203</td>
<td>Software Engineering Methodologies</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>PC-VIII</td>
<td>CSEC 204</td>
<td>Machine Learning Techniques</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>PE-III</td>
<td>CSEE 205</td>
<td>Professional Elective – III</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>PE-IV</td>
<td>CSEE 206</td>
<td>Professional Elective – IV</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>PC Lab-II</td>
<td>CSEP 207</td>
<td>Operating Systems and DBMS Lab</td>
<td>-</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Semin</td>
<td>CSES 208</td>
<td>Seminar</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>100</td>
<td>-</td>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>24</td>
<td>5</td>
<td>290</td>
<td>510</td>
<td>800</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Category</td>
<td>Course Code</td>
<td>Course Code</td>
<td>Course</td>
<td>L</td>
<td>P</td>
<td>T</td>
<td>CA</td>
<td>FE</td>
<td>Total</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
<td>-------------</td>
<td>-------------</td>
<td>---------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>----</td>
<td>----</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>OE-I</td>
<td>CSEE 301</td>
<td></td>
<td>Open Elective – I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>OE-II</td>
<td>CSEE 302</td>
<td></td>
<td>Open Elective – II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Thesis</td>
<td>CSET 303</td>
<td></td>
<td>Thesis Phase-I</td>
<td></td>
<td></td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>Ind Train</td>
<td>CSEI 304</td>
<td></td>
<td>Industrial Training</td>
<td></td>
<td></td>
<td>*</td>
<td>100</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>-</td>
<td>4</td>
<td>190</td>
<td>210</td>
<td>400</td>
</tr>
</tbody>
</table>

Note: * - Four weeks during the summer vacation at the end of II\textsuperscript{nd} Semester

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Category</th>
<th>Course Code</th>
<th>Course Code</th>
<th>Course</th>
<th>L</th>
<th>P</th>
<th>T</th>
<th>CA</th>
<th>FE</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thesis</td>
<td>CSET 401</td>
<td></td>
<td>Thesis Phase-II</td>
<td></td>
<td></td>
<td>8</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td>12</td>
</tr>
</tbody>
</table>

L- Lecture ; P- Practical; T- Thesis; CA- Continuous Assessment; FE- Final Examination

**Part Time**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Category</th>
<th>Course Code</th>
<th>Course Code</th>
<th>Course</th>
<th>L</th>
<th>P</th>
<th>T</th>
<th>CA</th>
<th>FE</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PC-I</td>
<td>PCSEC 101</td>
<td></td>
<td>Mathematics for Computing</td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>PC-II</td>
<td>PCSEC 102</td>
<td></td>
<td>Advanced Algorithm and Data Structures</td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>PC-III</td>
<td>PCSEC 103</td>
<td></td>
<td>Computer Network Engineering and Management</td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>75</td>
<td>225</td>
<td>300</td>
<td>9</td>
</tr>
</tbody>
</table>

Equivalent Course Code in M.E. Full Time

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Category</th>
<th>Course Code</th>
<th>Course Code</th>
<th>Course</th>
<th>L</th>
<th>P</th>
<th>T</th>
<th>CA</th>
<th>FE</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PCSEC 101</td>
<td></td>
<td>Mathematics for Computing</td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>PC-III</td>
<td>PCSEC 103</td>
<td></td>
<td>Computer Network Engineering and Management</td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
</tr>
</tbody>
</table>

Total 300 9
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Category</th>
<th>Course Code</th>
<th>Course</th>
<th>L</th>
<th>P</th>
<th>T</th>
<th>CA</th>
<th>FE</th>
<th>Total</th>
<th>Credits</th>
<th>Equivalent Course Code in M.E. Full Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Semester – II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PC-IV</td>
<td>PCSEC 201</td>
<td>Database Organization and Design</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>CSEC 201</td>
</tr>
<tr>
<td>2</td>
<td>PC-V</td>
<td>PCSEC 202</td>
<td>Operating System Design</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>CSEC 202</td>
</tr>
<tr>
<td>3</td>
<td>PC-VI</td>
<td>PCSEC 203</td>
<td>Software Engineering Methodologies</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>CSEC 203</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>75</td>
<td>225</td>
<td>300</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Semester – III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PC-VII</td>
<td>PCSEC 301</td>
<td>Graphics and Computer Vision</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>CSEC 104</td>
</tr>
<tr>
<td>2</td>
<td>PE-I</td>
<td>PCSEE 302</td>
<td>Professional Elective – I</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>CSEE 105</td>
</tr>
<tr>
<td>3</td>
<td>PE-II</td>
<td>PCSEE 303</td>
<td>Professional Elective – II</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>CSEE 106</td>
</tr>
<tr>
<td>4</td>
<td>PC Lab-I</td>
<td>PCSEP 304</td>
<td>Data Structures &amp; Graphics using C++ Lab</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td>2</td>
<td>11</td>
<td>11</td>
<td>CSEP 107</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>12</td>
<td>3</td>
<td>-</td>
<td>115</td>
<td>285</td>
<td>400</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Semester – IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PC-VIII</td>
<td>PCSEC 401</td>
<td>Machine Learning Techniques</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>CSEC 204</td>
</tr>
<tr>
<td>2</td>
<td>PE-III</td>
<td>PCSEE 402</td>
<td>Professional Elective – III</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>CSEE 205</td>
</tr>
<tr>
<td>3</td>
<td>PE-IV</td>
<td>PCSEE 403</td>
<td>Professional Elective – IV</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>CSEE 206</td>
</tr>
<tr>
<td>4</td>
<td>PC Lab-II</td>
<td>PCSEP 404</td>
<td>Operating Systems and DBMS lab</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td>2</td>
<td>11</td>
<td>11</td>
<td>CSEP 207</td>
</tr>
<tr>
<td>5</td>
<td>Semin</td>
<td>PCSES 405</td>
<td>Seminar</td>
<td>2</td>
<td>100</td>
<td>-</td>
<td>100</td>
<td>1</td>
<td>11</td>
<td>11</td>
<td>CSES 208</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>12</td>
<td>5</td>
<td>-</td>
<td>215</td>
<td>285</td>
<td>500</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Catego ry</td>
<td>Course Code</td>
<td>Course</td>
<td>L</td>
<td>P</td>
<td>T</td>
<td>CA</td>
<td>FE</td>
<td>Total</td>
<td>Credits</td>
<td>Equivalent Course Code in M.E. Full Time</td>
</tr>
<tr>
<td>--------</td>
<td>--------------</td>
<td>-------------</td>
<td>-----------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>----</td>
<td>----</td>
<td>-------</td>
<td>---------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Semester – V</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>OE-I</td>
<td>PCSEE 501</td>
<td>Open Elective – I</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>CSEE 301</td>
</tr>
<tr>
<td>2</td>
<td>OE-II</td>
<td>PCSEE 502</td>
<td>Open Elective – II</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>75</td>
<td>100</td>
<td>3</td>
<td>CSEE 302</td>
</tr>
<tr>
<td>3</td>
<td>Thesis</td>
<td>PCSET 503</td>
<td>Thesis Phase-I</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td>4</td>
<td>CSET 303</td>
</tr>
<tr>
<td>4</td>
<td>Ind Train</td>
<td>PCSEI 504</td>
<td>Industrial Training</td>
<td>-</td>
<td>-</td>
<td>*</td>
<td>100</td>
<td>-</td>
<td>100</td>
<td>2</td>
<td>CSEI 304</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>8</td>
<td>-</td>
<td>4</td>
<td>190</td>
<td>210</td>
<td>400</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

Note: * - Four weeks during the summer vacation at the end of IVth Semester

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Catego ry</th>
<th>Course Code</th>
<th>Course</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>CA</th>
<th>FE</th>
<th>Total</th>
<th>Credits</th>
<th>Equivalent Course Code in M.E. Full Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Semester – VI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Thesis</td>
<td>PCSET 601</td>
<td>Thesis Phase-II</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td>12</td>
<td>CSET 401</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

L- Lecture ; P- Practical; T- Thesis; CA- Continuous Assessment; FE- Final Examination

**LIST OF PROFESSIONAL ELECTIVES**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Professional Electives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Multicore Architecture</td>
</tr>
<tr>
<td>2</td>
<td>Advanced Image Processing</td>
</tr>
<tr>
<td>3</td>
<td>Advanced Mobile Computing</td>
</tr>
<tr>
<td>4</td>
<td>VLSI Technology</td>
</tr>
<tr>
<td>5</td>
<td>Knowledge Based Systems</td>
</tr>
<tr>
<td>6</td>
<td>Advanced Computer Architecture</td>
</tr>
<tr>
<td>7</td>
<td>Object Oriented Modeling and Design</td>
</tr>
<tr>
<td>8</td>
<td>Real Time System concepts</td>
</tr>
<tr>
<td>S.No</td>
<td>Open Electives</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Big Data Analytics</td>
</tr>
<tr>
<td>2</td>
<td>Cloud Computing Technologies</td>
</tr>
<tr>
<td>3</td>
<td>Wearable Computing</td>
</tr>
<tr>
<td>4</td>
<td>Internet of Things (IoT)</td>
</tr>
<tr>
<td>5</td>
<td>Multimedia Systems</td>
</tr>
<tr>
<td>6</td>
<td>Advanced Web Design</td>
</tr>
<tr>
<td>7</td>
<td>Internet Programming Tools</td>
</tr>
<tr>
<td>8</td>
<td>Mobile Application Development Framework</td>
</tr>
<tr>
<td>9</td>
<td>Advanced Soft Computing</td>
</tr>
<tr>
<td>10</td>
<td>Human Computer Interaction</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:
- To introduce the basic concepts of one dimensional and two dimensional Random Variables.
- To provide information about Estimation theory, Correlation, Regression and Testing of hypothesis.
- To enable the students to use the concepts of Linear programming problem, PERT-CPM Random Variables – Probability Function – Moments – Moment Generating Functions and Their Properties – Binomial, Poisson, Uniform and Normal Distributions – Functions of a Random Variable.

Joint Distributions – Marginal and Conditional Distributions – Functions of Two Dimensional Random Variables – Regression Curve – Correlation.

Sampling Distributions – Type I and Type II Errors – Tests based on Normal, t, chi square and F Distributions For Testing Of Mean, Variance And Proportions – Tests for Independence of Attributes and Goodness of Fit.

Design of experiments and statistical quality control:
Basic principle of experimental design – completely randomized design – analysis of variance for one way classification or one factor experiments – Randomized block design – Analysis of variance for two way classification or two factor experiments – Latin square design – Analysis of variance for three factor experiments – RDB and LSD comparison.

Formulation – Graphical method – Simplex method – Big M Method – Transportation and assignment problems – Travelling salesman problem - Project Scheduling by PERT and CPM

REFERENCES:
COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Identify the type of random variable and distribution for a given operational conditions/scene
2. Study and Design appropriate distribution model for a given problem/system situation
3. Differentiate/infer the merit of sampling tests.
4. Formulate and find optimal solution in the real life optimizing/allocation/assignment problems involving conditions and resource constraints.

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
• To be familiar with basic techniques of algorithm analysis.
• To choose the appropriate data structure and algorithm design method for a specified application.
• To emphasize the concept of data abstraction and understanding of abstract data types.
• To assess how the choice of data structures and algorithm design methods impacts the performance of programs.


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to

1. Basic ability to analyze algorithms and to determine algorithm correctness and time efficiency.
2. Apply data abstraction in solving programming problems.
3. Master different algorithm design techniques
4. Ability to apply and implement learned algorithm design techniques and data structures to solve problems.

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PO1</strong></td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:
- To know the fundamentals of network architectures
- To explicate various protocols and its functionalities
- To study about different network management standards

Introduction - Network hardware - Network software - Reference models: OSI reference model - TCP/IP reference model - Comparison - Data link layer design issues - Error detection and correction - Multiple access protocols - 802.11 architecture and protocol stack - 802.16 architecture and protocol stack - Bluetooth architecture and protocol stack.


The Transport layer: The transport service - Elements of transport protocols - UDP - TCP - The session layer: Session characteristics - session service - ISO session protocol - Other session approaches.


REFERENCES:
COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Acquire the knowledge of network layered approaches.
2. Understand the algorithms and operations of various protocols.
3. Analysis and implement new protocols for various network functionalities.
4. Design the architecture of network management.

Mapping with Programme Outcomes

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To review computer graphics techniques for computer vision
- To understand imaging and filtering operations.
- To study shape and boundary pattern analysis techniques.
- To explain 3D vision methods.
- To study some applications and case studies of computer vision algorithms


3D - Vision and variety of methods – Shape and shading – Photometric stereo – Shape and texture – Real-time pattern recognition systems: Case study on location of cereals and insects, Surveillance – In-Vehicle vision systems.

REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Implement computer graphics techniques required for computer vision.
2. Apply the concepts of visible and illumination methods.
3. Implement 3D vision techniques.
4. Develop computer vision algorithms

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:
- To develop skills to design and analyze simple linear and non-linear data structures.
- To strengthen the ability to identify and apply the suitable data structure for the given real-world problem.
- To gain knowledge in practical applications of data structures.
- To understand the need of developing graphics applications.
- To learn algorithmic development of graphics primitives like: line, circle, ellipse, polygon etc.
- To learn the representation and three-dimensional transformation.

LIST OF EXERCISES

CYCLE – I

1(a). Write a C++ Program to implement Stack.
1(b). Write a C++ Program to perform Evaluation of Expression.
2. Write a C++ Program to implement Queue.
3. Write a C++ Program to implement Priority Queue.
4(a). Write a C++ Program to perform Single Linked List.
4(b). Write a C++ Program to perform Double Linked List.
4(c). Write a C++ Program to perform Circular Linked List.
5. Write a C++ Program to create a Binary Tree Traversal.
6(a). Write a C++ Program to perform Merge Sort.
6(b). Write a C++ Program to perform Heap Sort.
6(c). Write a C++ Program to perform Bubble Sort.
6(d). Write a C++ Program to perform Quick Sort.
7(a). Write a C++ Program to perform Sequential Search.
7(b). Write a C++ Program to perform Binary Search.

CYCLE – II

8. Write a C++ Program to draw a line using DDA and Bresenham line drawing algorithm.
9. Write a C++ Program to draw a circle and ellipse using midpoint circle algorithm and midpoint ellipse algorithm.
10. Write a C++ Program to perform three-dimensional transformations.
11. Write a C++ Program to perform polygon clipping using sutherland hodgeman algorithm.
12. Write a C++ Program to draw a bezier curve.
13. Write a C++ Program to draw bspline curve.
14. Write a C++ Program to generation of natural sceneries using fractals.

**COURSE OUTCOMES:**
At the end of this course, the students will be able to
1. Understand to design and analyze the time and space efficiency of the data structure
2. Understand and capable to identity the appropriate data structure for given problem
3. Understand the practical knowledge on the application of data structures
4. Understand the need of developing graphics applications
5. Learned algorithmic development of graphics primitives like: line, circle, ellipse, polygon etc. and the representation and three dimensional transformations

| Mapping with Programme Outcomes |
|---------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
| CO1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| CO5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

**COURSE OBJECTIVES:**
- To understand the fundamentals of DBMS, E-R Diagrams and to impart the concepts of the Relational model, SQL, various Normal Forms and Query Processing.
- To inculcate the fundamentals of Transaction Management, Data mining and Data Warehousing.
- To disseminate the knowledge on Emerging Database Technologies.

**File System vs. DBMS**
- Views of data
- Data Models
- Database Languages
- Database Management System Services
- Overall System Architecture
- Data Dictionary
- Entity


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Differentiate database systems from file systems by enumerating the features provided by database systems, Analyze data storage problem and derive a data model using E-R Diagrams and Formulate the solutions to a broad range of query and data update problems using SQL
2. Understand the normalization theory and apply such knowledge to the normalization of a database
3. Design and implement Transaction management, Data Mining and Data Warehousing.
4. Inculcate the various emerging database technologies.

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CO1</strong></td>
</tr>
<tr>
<td><strong>CO2</strong></td>
</tr>
<tr>
<td><strong>CO3</strong></td>
</tr>
<tr>
<td><strong>CO4</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CSEC202</th>
<th>OPERATING SYSTEM DESIGN</th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVES:**
- To learn the fundamentals of Operating Systems, Processes, Deadlocks, inter-process communication, synchronization and mutual exclusion.
- To gain knowledge on memory management concepts and design issues.
- To gain insight on to the I/O devices and Device management design issues.
- To know the components and management aspects of File system and to understand the OS protection mechanisms.
- Understanding the various operating system design issues with the help of case studies.


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Demonstrate understanding of the concepts, structure and design of operating Systems
2. Demonstrate understanding of operating system design and its impact on application system design and performance
3. Demonstrate competence in recognizing and using operating system features

| Mapping with Programme Outcomes |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
| CO1 | ✓   |     |     |     |     |     |     |     |
| CO2 |     |     |     |     |     |     |     |     |
| CO3 | ✓   | ✓   | ✓   |     |     |     |     |     |
COURSE OBJECTIVES:

- To introduce the various software development process models
- To explain the phases of software development
- To facilitate an understanding of umbrella activities in software development


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Select and apply the process methodology suitable for software application development.
2. Develop the design models for software applications.
3. Apply the testing strategies and techniques in real world situations.
4. Estimate project cost, effort, duration and risks for software projects.

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To introduce the fundamental concepts of machine learning and its applications
- To learn the classification, clustering and regression machine learning algorithms

COURSE DETAILS:

COURSE OUTCOMES:

<table>
<thead>
<tr>
<th>CSEC204</th>
<th>MACHINE LEARNING TECHNIQUES</th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
• To understand the methods of solving real life problems using the machine learning techniques

Introduction and Bayesian Decision Theory: Machine perception - feature extraction - classification, clustering and regression - design cycle - types of learning. Bayesian decision theory - classifiers, discriminant functions, and decision surfaces - univariate and multivariate normal densities - Bayesian belief networks.


Combining Multiple Learners: Generating diverse learners - model combination schemes - voting - error-correcting output codes - bagging - boosting - mixture of experts revisited - stacked generalization - fine-tuning an ensemble - cascading.

REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. understand the basic concepts of machine learning
2. implement the classification, clustering and regression algorithms
3. design and implement a method for solving real life problem using a suitable machine learning technique
4. combine the evidence from two or more models/methods for designing a system.
COURSE OBJECTIVES:

- To learn the fundamentals of Operating Systems
- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
  Master the basics of SQL and construct queries using SQL.
- Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.
- Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.
- To present the concepts and techniques relating to ODBC and its implementations.

LIST OF EXERCISES

OPERATING SYSTEM

1. CPU Scheduling Algorithms
   a. First Come First Served Scheduling
   b. Shortest Job First Scheduling
   c. Priority Scheduling
   d. Round Robin Scheduling

2. Producer Consumer Problem
3. Matrix Multiplication using Multithreading
4. Bankers Algorithm
5. Paging
6. Segmentation
7. Dynamic Storage Allocation Problem
8. Disk Scheduling
9. File Management

**DBMS**

1. Student management system using SQL commands
2. Employee management using PL/SQL functions
3. Creation of Index and Trigger
4. Creation of Table Partition
5. ODBC and JDBC Connectivity

**COURSE OUTCOMES:**
At the end of this course, the students will be able to

1. Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
2. Learn the various resource management techniques for distributed systems
3. Design and implement a database schema for a given problem-domain
4. Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS
5. Design and build a GUI application using a 4GL

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
<tr>
<td>CO5</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:
- To work on a technical topic related to Computer Science and Engineering and acquire the ability of written and oral presentation
- To acquire the ability of writing technical papers for Conferences and Journals

The students will work for two periods per week guided by student counselor. They will be asked to present a seminar of not less than 15 minutes and not more than 30 minutes on any technical topic of student’s choice related to Computer Science and Engineering and to engage in discussion with audience. They will defend their presentation. A brief copy of their presentation also should be submitted. Evaluation will be done by the student counselor based on the technical presentation, the report and also on the interaction shown during the seminar.

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. The students will be trained to face the audience and to interact with them confidently
2. To tackle any problem during group discussion in the corporate interviews
3. To acquire the ability to work in the actual environment and to use the technical resources

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:
- To train the students in the current thrust area in Computer Science and Engineering and to have practical knowledge in handling the technical scenario
- To develop skills on the research topic and to implement the appropriate methods to handle the issue

The students will individually undertake a research problem in the field of Computer Science and Engineering in the third semester for Full-Time / Fifth semester for Part-Time. The student will be guided by a staff member. The progress of the research will be evaluated every month by a team of staff members. The student has to submit the detailed report on the research problem at the end of Third semester for Full-Time / Fifth semester for Part-Time. The student will be evaluated by a team of examiners nominated by the Head of the Department through a viva-voce examination.

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Conduct independent empirical research to evaluate and present their results responsibly and critically
2. Present the conclusions with understandability using appropriate tables and graphs in the form of report
3. Maintain the ethical standards of scientific research and to follow the basic principles in an academic community that requires constant learning and knowledge updation

Mapping with Programme Outcomes

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Note: * - Four weeks during the summer vacation at the end of II\textsuperscript{nd} Semester

**COURSE OBJECTIVES:**
- To train the students in the field work related to Computer Science and Engineering and to have a practical knowledge in carrying out the Computer Science and Engineering related problems
- To train and develop skills in solving problems during execution of the problems related to Computer Science and Engineering

The students will individually undertake a training program in reputed concerns in the field of Computer Science and Engineering during summer vacation (at the end of second semester for Full Time / Fifth semester for Part – Time) for a minimum stipulated period of four weeks. At the end of training the student has to submit the detailed report on the training undertaken within ten days from the commencement of the third semester for Full Time / Fifth semester for Part – Time. The student will be evaluated by a team of staff members nominated by the Head of the Department through a viva-voce examination.

**COURSE OUTCOMES:**
At the end of this course, the students will be able to
1. Apply prior acquired knowledge in problem solving and to demonstrate the use, interpretation and application of an appropriate international Computer Science and Engineering standard in a specific situation
2. Analyze a given Computer Science and Engineering problem and to identify and implement appropriate problem solving methodology to propose a meaningful solution
3. Present the solution acquired in the form of written and oral presentation

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PO1</strong></td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:
- To train the students in the current thrust area in Computer Science and Engineering and to have practical knowledge in handling the technical scenario
- To develop skills on the research topic and to implement the appropriate methods to handle the issue

The students will continue the research problem undertaken during third semester for Full-Time / Fifth semester for Part-Time in the field of Computer Science and Engineering. The student will be guided by a staff member. The progress of the research will be evaluated every month by a team of staff members. The student has to submit the detailed report on the research problem at the end of Fourth semester for Full-Time / Sixth semester for Part-Time. The student will be evaluated by a team of examiners nominated by the Head of the Department through a viva-voce examination.

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Conduct independent empirical research to evaluate and present their results responsibly and critically
2. Present the conclusions with understandability using appropriate tables and graphs in the form of report
3. Maintain the ethical standards of scientific research and to follow the basic principles in an academic community that requires constant learning and knowledge updation

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
</tbody>
</table>
PROFESSIONAL ELECTIVES
COURSE OBJECTIVES:

- To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters
- To understand the different multiprocessor issues
- To expose the different types of multicore architectures
- To understand the design of the memory hierarchy


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Identify the limitations of ILP and the need for multicore architectures
2. Discuss the issues related to multiprocessing and suggest solutions
3. Point out the salient features of different multicore architectures and how they exploit parallelism
4. Critically analyze the different types of inter connection networks
5. Design a memory hierarchy and optimize it

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To understand representation of digital images in the spatial and frequency domains.
- To understand Image Compression, Segmentation and image compression standards.
- To provide an in-depth understanding of various concepts related to image Representation and Description


2-D Fourier transform, Fast Fourier transform, Other separable transforms: Walsh Transform, Hadamard Transform, Discrete Cosine Transform, wavelet Transform, Haar function, Gabor Transform, Hotelling transforms.


Image compression: Redundancies, image compression models, elements of information theory, error-free compression variable length coding, bit plane coding, lossless predictive coding, lossy compression, predictive coding, transform coding, image compression standards - JPEG, MPEG.

Image Analysis: Segmentation, detection of discontinuities, edge linking and boundary detection, Edge Operators, thresholding, region-oriented segmentation.
Image Representation and Description: Representation schemes, Boundary descriptors, Regional descriptors.

REFERENCES:
5. Yao Wang, Joern Ostermann, Ya-Qin Zhang, Video Processing in Communication

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Acquire knowledge of principles of digital image processing.
2. To be able to solve problems pertaining to the field of image acquisition, preprocessing, Fourier domain processing.
3. To perform basic image restoration, image segmentation and image compression.
4. To provide the foundations for life-long learning and continual professional development in the areas of image applications.

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:

- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations
- To understand the typical mobile networking infrastructure through a popular GSM Protocol
- To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
- To understand the database issues in mobile environments & data delivery models
- To understand the ad hoc networks and related concepts
- To understand the platforms and protocols used in mobile environment

Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices. GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS, CSHSD, DECT.

Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.


Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, Mobile Agents, Service Discovery.

REFERENCES:
COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Grasp the concepts and features of mobile computing technologies and applications.
2. Have a good understanding of how the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support.
3. Identify the important issues of developing mobile computing systems and applications.
4. Organize the functionalities and components of mobile computing systems into different layers and apply various techniques for realizing the functionalities.

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To design and analyze digital circuits
- To layout design techniques
- To synthesis tool for hardware design
- To Introduced digital integrated circuits


Programmable Logic Array (PLA) and Finite State Machines – Design of ALUs – Memories and Registers – Introduction to Analog VLSI - Realization of Neural Networks and Switched capacitor filters – Sub-Micron technology and GaAs VLSI technology.

Electronic Grade Silicon – Czochralski Growing – Silicon shaping – Processing consideration – Vapor Phase Epitaxy – Molecular Beam Epitaxy - Silicon on Insulators – Epitaxial Evaluation –


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be
1. Aware about the trends in semiconductor technology, and how it impacts scaling and performance.
2. Able to learn Layout, Stick diagrams, Fabrication steps, Static and Switching characteristics of inverters.
3. Able to synthesis the digital VLSI systems from register-transfer or higher level descriptions in hardware design languages.
COURSE OBJECTIVES:

- To learn the concepts of knowledge base and inference engine.
- Machine Learning.


REFERENCES:


COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Understand the knowledge-based systems engineering.
2. Understand Expert System.
3. Understand the basic concepts of Machine Learning.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To understand the trends in computer architecture.
- To understand the various levels of parallelism.
- To understand the design challenges in building a computer system.


Instruction-Level Parallelism: Concepts and Challenges - Basic Compiler Techniques for Exposing ILP - Reducing Branch Costs with Advanced Branch Prediction - Overcoming Data Hazards with Dynamic Scheduling - Dynamic Scheduling: Examples and the Algorithm - Hardware-Based Speculation - Exploiting ILP Using Multiple Issue and Static Scheduling - Exploiting ILP Using Dynamic Scheduling, Multiple Issue, and Speculation - Advanced Techniques for Instruction Delivery and Speculation - Studies of the Limitations of ILP - Case Study.
Introduction - Vector Architecture - SIMD Instruction Set Extensions for Multimedia - Graphics Processing Units - Detecting and Enhancing Loop - Level Parallelism - Crosscutting Issues - Case Study.


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Select the architecture appropriate for building state-of-the-art computer systems.
2. Comprehend the levels of parallelism to improve system performance.
3. Design computer systems to meet specific performance requirements.
4. Interpret the issues and challenges in hardware design.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:
- To learn the basics of object-oriented modelling and design concepts
- To understand the UML design diagrams
- To learn various testing strategies
- Learn to develop applications using Object Oriented Programming Concepts
- Learn to solve a real world problems based on Object Oriented Principles


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Analyze and design a computer program based on Object Oriented Principles
2. Design and implement projects using OO concepts
3. Apply appropriate design patterns and create code from design
4. Solve a real world problems based on Object Oriented Principles
5. Implement features of object oriented programming to solve real world problems

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
<tr>
<td>CO5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CSEE XOX</th>
<th>REAL TIME SYSTEM CONCEPTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To study issues related to the design and analysis of systems with Real-time constraints
- To learn the features of Real time operating system.
- To study the various Uniprocessor and Multiprocessor scheduling mechanisms.
- To learn about various real time communication protocols.
- To study the difference between traditional and Real-time databases

Introduction to Real-time computing - Concepts; Example of real-time applications – Structure of a real time system – Characterization of real time systems and tasks - Hard and Soft timing constraints - Design Challenges - Performance metrics - Prediction of Execution Time: Source
code analysis, Micro-architecture level analysis, Cache and pipeline issues- Programming Languages for Real-Time Systems

Real time OS – Threads and Tasks – Structure of Microkernel – Time services – Scheduling Mechanisms Communication and Synchronization – Event Notification and Software interrupt

Task assignment and Scheduling - Task allocation algorithms -Single-processor and Multiprocessor task scheduling - Clock-driven and priority-based scheduling algorithms- Fault tolerant scheduling


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Understand about Schedule ability analysis
2. Learn Real-time programming environments
3. Know about real time communication and databases
4. Develop real time systems

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:

- To Understand Data mining principles and techniques
- To study the overview of Visualization and Statistical Perspectives and clustering techniques in details for better organization and retrieval of data
- To understand the concept of Predictive Modelling for the retrieval purposes
- To expose the students to the concepts of Data warehousing Architecture and Implementation
- To identify Business applications and Tools of Data mining


Applications - Tools – Applications – Case studies.

REFERENCES:


**COURSE OUTCOMES:**
At the end of this course, the students will be able to
1. Learn about the fundamentals of data mining
2. Discover the knowledge imbibed in the high dimensional system
3. Cluster the high dimensional data for better organization of the data
4. Apply the Predictive Modelling techniques for mining the data
5. Study the various mining applications and tools

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
<tr>
<td>CO5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CSEE XOX</th>
<th>DESIGN AND ANALYSIS OF PARALLEL ALGORITHMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVES:**
- To understand the need for parallel computers and algorithms
- To learn different models of parallel computation
- To expose the students to parallel sorting, merging, searching, matrix, graph theory and combinatorial problems and solve using parallel algorithms
- To become aware of various parallel programming models
- To analyze parallel algorithms

Parallel Reduction, Prefix Sums – Parallel Programming Models: MPI, Shared Memory, Message Passing.


REFERENCES:

COURSE OUTCOMES:
At the end of the course, the students will be able to
1. Realize the need for parallel computers and algorithms
2. Classify the parallel architectures
3. Design parallel algorithms for a given application.
4. Identify and implement suitable programming models for a given problem
5. Analyze the parallel algorithm.
### Mapping with Programme Outcomes

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CSEE XOX | ADVANCED SYSTEM SOFTWARE | L | T | P
--- | --- | --- | --- | ---
4 | 0 | 0

### COURSE OBJECTIVES:
- To understand the fundamentals of system software, compiler design and code generation
- To acquire the depth knowledge in parsers, macro processors and assemblers
- To learn the basic automata theory to generate a lexical analyzer
- To implement the optimization techniques for designing a code generator

Introduction: Overview of System Software and machine architecture – Assemblers – One pass assemblers - Multi pass assemblers - Loaders – Linkers - Macro processors – Their Features and Functions


Code optimization techniques: Procedure and memory hierarchy optimization - In-line expansion - Shrink wrapping - Code scheduling - Instruction scheduling - Speculative scheduling - Trace
scheduling - Register allocation and assignment – Graph coloring - Data flow analysis - alias analysis - Software pipelining - Run time support - Register usage - Code sharing - Position independent code - Examples of real world implementation of system software.

REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Acquire knowledge of assemblers, compilers, linkers and loaders
2. Understand the virtual machines and their architecture
3. Implement the optimization of system software code for real world applications
4. Design lexical analyzer using appropriate tool and a simple code generator

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
</tbody>
</table>

52
COURSE OBJECTIVES:

- To understand the fundamentals of information security
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- Analyze key terms and critical concepts of information security
- To understand the fundamentals of Cryptography

An Overview of Computer Security

- Security Services
- Security Mechanisms
- Security Attacks
- Access Control Matrix, Policy
- Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

Classical Cryptography

- Substitution Ciphers
- permutation Ciphers
- Block Ciphers
- DES Modes of Operation
- AES-Linear Cryptanalysis, Differential Cryptanalysis
- Hash Function - SHA 512
- Message Authentication Codes-HMAC - Authentication Protocols

Introduction to Public key Cryptography

- Number theory
- The RSA Cryptosystem and Factoring
- Integer
- Attacks on RSA-The ELGamal Cryptosystem
- Digital Signature Algorithm
- Finite Fields
- Elliptic Curves Cryptography
- Key management – Session and Interchange keys, Key exchange and generation-PKI.


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

REFERENCES:


COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Realize basic security algorithms for a computing system.
2. Analyze the vulnerabilities in any computing system and consequently be capable to design a security justification.
3. Recognize the security issues in the network and resolve it.
4. Evaluate security means using exact approaches, together with theoretical root, modeling, and simulations

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To expose the students about the fundamentals of Embedded System
- To impart the knowledge in RTOS based Embedded System Design
- To educate about Firmware design and development
- To discuss on aspects required in Embedded system design techniques
- To state the real time applications with case studies

Embedded System Vs General Computing System - Classification of Embedded System, Purpose of Embedded system, Quality Attributes of Embedded System - Typical Embedded
System- Core of Embedded System, Memory, Sensors and Actuators, Communication Interface-
Onboard communication interface, External communication interface.

Embedded Firmware Design Approaches- Embedded Firmware Development Languages -
Embedded System Development Environment - IDE, Compiler, Linker - Types of File
Generated on Cross Compilation-Simulator, Emulator and Debugging- Fundamental issues in
Hardware Software Co-design- Integration and Testing of Embedded Hardware and Firmware.

Introduction to basic concepts of RTOS- Types of Operating systems, Tasks, Process and
Threads, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task
communication shared memory, message passing-Task synchronization between processes-
semaphores-Devices driver- Selection of RTOS-Comparison of Realtime Operating systems:
VxWorks, ςC/OS-II, RT Linux.

Design methodologies, Design Flows-Requirement analysis-Specifications-Control-Oriented
Specification languages, Advanced Specifications- System analysis and Architecture design-
CRC Cards-Quality Assurance-Quality assurance Techniques, Verifying the specifications,
Design reviews, Measurement-driven quality assurance.

Elevator Controller – Battery Operated Smartcard Reader- Automated Meter Reading system-
Digital Camera.

REFERENCES:
2. David E. Simon, “An Embedded Software Primer”, Pearson Education Asia,
Business Media B.V. 2009.

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Recognize the key features of embedded systems in terms of computer hardware and be
able to discuss their functions.
2. Aware of the key factors in embedded system design and development.
3. Explain the special extra-functional that are imposed on embedded systems.
4. Explain the basic operation of a real-time operating system.
Mapping with Programme Outcomes

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To understand the requirement collection process for developing a software
- To learn the leadership qualities to manage peoples in an organization
- To understand the risk management for successful project completion

Project definition - Contract management - Activities covered by software project management - Overview of Project planning - Stepwise project planning - Decision making - Leadership - Organizational structures.


Objectives - Project schedule - Sequencing and scheduling activities - Network planning models - Forward pass - Backward pass - Activity float - Shortening project duration - Activity on arrow networks.


Introduction - Understanding behavior - Organizational behavior - background - Selecting the right person for the job - Instruction in the best methods – Motivation - Hackman job characteristics model - Working in groups.

REFERENCES:

COURSE OUTCOMES:
1. Understand project management activities and steps in Project Planning.
2. Create an effective cost estimation technique that suits all types of projects.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To provide an introduction to the central issues of Natural Language Processing (NLP) in relation to linguistics and statistics.
- To understand the fundamentals of word structure and parts-of-speech tagging.
- To understand the basics of speech sounds and speech recognition models.
- To recognize the applications of NLP such as question answering, summarization, document categorization and machine translation techniques.


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Attain fundamental knowledge in natural language processing.
2. Describe the methods for morphological analysis and parts of speech tagging.
3. Familiarize with techniques used for speech recognition.
4. Acquire knowledge on linguistic information using parsing techniques.
5. Gain comprehensive knowledge on applications of NLP.
COURSE OBJECTIVES:

- To understand the fundamentals of Ad Hoc Network architecture, Protocols, Issues
- To introduce the various types of Ad Hoc routing protocols
- To provide in-depth knowledge about Sensor Network Architecture, its Applications and MAC Protocols for sensor networks.
- To elucidate issues in WSN routing, Indoor and outdoor Localization and Quality of Service in WSN
- To emphasize on Necessity for Mesh Networks, IEEE 802.11s Architecture and different types of Mesh Networks


REFERENCES:

2. C.SivaRamMurthy and B.Smanoj, “Ad Hoc Wireless Networks – Architectures and

**COURSE OUTCOMES:**
At the end of this course, the students will be able to

1. Understand knowledge of Ad Hoc networking basics and Architecture.
2. Implement Ad hoc routing protocols and analyzing the performances of Protocols.
4. Design and implement the Mesh networks with MAC enhancements.

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CSEE XOX</th>
<th>SOFTWARE QUALITY AND TESTING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVES:**
- To impart the fundamental knowledge of testing and quality assurance.
- To introduce the various techniques for testing.
- To introduce the concepts and significance of quality and quality assurance.
- To explain the procedures for quality planning and assessment.

Basic Concepts and Preliminaries: Quality Revolution - Software Quality - Role Of Testing - Verification and Validation - Failure, Error, Fault, and defect - Notion of software Reliability - objective of testing - What Is the test case - Expected Outcome - Central Issues Of testing - Testing Activities - Test Levels - White Box and Black Box Testing - Test Planning and Design - Test Tools and Automation.


Quality Engineering: Activities and Processes. Quality Planning: Goal setting and Strategy Formation. Quality Assessment and improvement, Quality Engineering in Software process

REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Apply modern software testing processes in relation to software development and project management.
2. Create test strategies and plans, design test cases, prioritize and execute them.
3. Ensure quality and efficient delivery of software solutions and implement improvements in the software development processes
4. Gain expertise in testing and quality assurance activities in the context of development of computer based systems and IT processes

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CSEE XOX</th>
<th>DIGITAL STEGANOGRAPHY AND WATERMARKING</th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVES:**
- To understand the basic principles and different types of steganography
- To make them understand the steganalysis
- To provide the basic knowledge of various methods in watermarking
- To know the current watermarking techniques
- To understand the types of watermarking and optimization techniques


Cryptographic and psycho visual aspects – Choice of a workspace – Formatting the watermark bits – Merging the watermark and the cover – Optimization of the watermark receiver – Extension from still images to video- Fingerprinting: Introduction – Examples, Terminology and Requirements, Classification, Research History, Schemes - Digital Copyright and Watermarking - Conflict of Copyright Laws on the Internet

REFERENCES:

COURSE OUTCOMES:
1. Develop skill to make and implement a simple Steganographic technique
2. Distinguish between Watermarking and Steganography techniques
3. Select the suitable steganography method to develop a new project.
4. Understand the existing digital watermarking techniques and formulate new ideas
5. Have a detailed knowledge of the watermarking techniques

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
<tr>
<td>CO5</td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To understand the basic mechanism of speech production and auditory perception.
- To learn the basic concepts of time and frequency domain analysis of speech signal.
• To explain the various parametric representation of speech.
• To acquire knowledge on several applications of speech and audio processing.


REFERENCES:
COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Acquired knowledge of speech production and auditory perception
2. Understand the time and frequency domain analysis of speech.
3. Acquired knowledge on various parameters of speech.
4. Ability to develop systems for various applications of speech processing.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To understand the fundamentals of image retrieval and image databases.
- To introduce different features and extraction methods
- To explain the various clustering and classification techniques
- To understand various distance measures and performance measures.

Annotation based image retrieval. Content Based Image Retrieval (CBIR): CBIR architectures; Region-based retrieval, Semantic-based retrieval, Context-based retrieval, Relevance Feedback. Types of image databases; Image Features. Image Clustering; Classification; Matching; Indexing.

Structured image databases, textured image database; image properties; Feature vector database. Image Features: colour based; colour models, texture based, shape based, spatial orientation. Edge and boundary based features.

Statistical methods: mean, variance, covariance, coefficient of variation, mean vector, covariance matrix, correlation, regression, co-occurrence matrix, Eigen vector. Histogram bins

Clustering: k-means algorithm, c-means algorithm, fuzzy c-means, kNN method, Branch and Bound method, Graph theoretic approach. Classification: Bayes classifier, Quadratic classifier.
Point-wise measures: Euclidean distance, Manhattan distance, Canberra distance; Distributional measures: Bhattacharyya distance, Mahalanobis distance, Kullback-Liebler distance, Chi-squared distance, Chebychev. Measure of performance: Precision, recall; F measures.

REFERENCES:
2. Oge Marques and Borko Furht, Content-Based Image and Video Image Retrieval, Kuluwar Academic Publisher, USA, 2002.
4. Jiawei Han, Micheline Kamber, and Jian Pei, Data Mining: Concepts and techniques, Third Ed., Elsevier, 2011.

COURSE OUTCOMES:
At the end of this course, the students will be able to

1. Acquire knowledge about various image retrieval systems.
2. Analyze different image databases and its uses.
3. Understand the different feature sets and its extraction methods.
4. Implement various classification and clustering algorithms.
5. Analyze different distance measures and performance measures.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:

- To study about medical image fundamentals
- To acquire knowledge in medical image storage and enhancement techniques
- To provide an up-to-date background in current state-of-the-art in medical imaging and applications of computational tools for medicine.

Introduction to medical imaging technology, systems, and modalities. Brief history, importance, applications, trends, challenges. Medical Image Formation Principles: X-Ray physics, X-Ray generation, attenuation, scattering, dose Basic principles of CT, reconstruction methods, artifacts, CT hardware.

Medical Image Storage, Archiving and Communication Systems and Formats Picture archiving and communication system (PACS), Formats: DICOM Radiology Information Systems (RIS) and Hospital Information Systems (HIS). Medical Image Processing, Enhancement, Filtering Basic image processing algorithms Thresholding, contrast enhancement, SNR characteristics, filtering, histogram modeling


PET and SPECT Ultrasound Imaging methods, mathematical principles, resolution, noise effect, 3D imaging, positron emission tomography, single photon emission tomography, ultrasound imaging, applications. Medical Image Search and Retrieval Current technology in medical image search, content-based image retrieval, new trends: ontologies. Applications. Other Applications of Medical Imaging Validation, Image Guided Surgery, Image Guided Therapy; Computer Aided Diagnosis/Diagnostic Support Systems.

REFERENCES:

**COURSE OUTCOMES:**
At the end of this course, the students will be able to

1. Acquire depth knowledge about the various medical image processing techniques
2. Attain practical knowledge in medical Imaging .
3. Perform research works in the area of medical imaging
4. Gain knowledge about how to extract, model, and analyze information from medical data and applications in order to help diagnosis, treatment and monitoring of diseases through computer science.

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PO1</strong></td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
<tr>
<td>CO4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CSEE XOX</th>
<th>OPTIMIZATION TECHNIQUES</th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVES:**
- To formulate and solve optimization problems
- To understand linear and non-linear programming problems
- To study the applications of optimization in engineering

Engineering Applications - Classification of optimization problems - Classical optimization techniques - Single & multivariable optimization - multivariable
optimization with & without constraints - Saddle point - Solution by the method of Lagrange multipliers - Kuhn - Tucker conditions.

Applications - Standard form of LPP - definitions & Theorem - Solution of a system of Linear simultaneous equations - Pivoted reduction - Simplex algorithm - Identifying an optimal point - Revised simplex methods - Gauss Jordan Elimination process - Duality in linear programming - Decomposition principle - Transportation problem - Northwest corner rule - Least cost method


Geometric programming - Polynomial - Unconstrained minimization problem - Constrained minimization problem - Primal and Dual programmes – Geometric programming with mixed inequality constraints – Complementary geometric programming.

Integer linear programming – Mixed integer programming – Integer non linear programming – Sequential linear discrete programming.

Dynamic programming: Multistage decision processes – Concept of sub optimization – Principle of optimality – Conversion of a final value problem into an initial value problem – Linear programming as a case of dynamic programming – Continuous dynamic programming – Applications.

REFERENCES:
COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Understand the importance of optimization.
2. Apply basic concepts of mathematics to formulate an optimization problem.
3. Analyze performance measures of optimization problems.
4. Know the optimized ways in engineering.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To study the concepts of wireless sensor networks
- To study the concepts of physical layer
- To understand the concepts of data link layer
- To understand the concept of routing
- To study the concepts of TimyOS

Challenges for wireless sensor networks, Comparison of sensor network with ad hoc networks, single node architecture-Hardware components, energy consumption of sensor nodes, network architecture-sensor network scenarios ,types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, design principles, Development of wireless sensor networks

Introduction, wireless channel and communication fundamentals-frequency allocation, modulation and demodulation, wave propagation effects and noise, channel models, spread spectrum communication, packet transmission and synchronization ,quality of wireless channels and measures for improvement, physical layer and transceiver design consideration in wireless sensor networks, Energy usage profile, choice of modulation, power management.
MAC protocols-fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, Contention-based protocols, schedule-based protocols - SMAC, BMAC, Traffic-adaptive medium access protocol (TRAMA), link layer protocols-fundamentals task and requirements, error control, Framing, link management.


Target detection tracking, Habitat monitoring, Environmental disaster monitoring, practical implementation issues, IEEE 802.15.4, low rate WPAN, Operating system Design issues, Introduction to TinyOS – NesC, interfaces, modules, configuration, Programming in TinyOS using NesC, Emulator TOSSIM.

REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Get a complete knowledge about wireless sensor networks
2. Get knowledge about all layers
3. Get the practical implementation issues

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:

- To provide the students with a basic understanding of the theory behind various video processing tasks.
- To learn the most popular and successful algorithms to solve video processing problems.


Image Segmentation: Thresholding - Clustering - Bayesian Methods - Graph-Based Methods - Active-Contour Models. Change Detection: Shot-Boundary Detection - Background Subtraction. Motion Segmentation: Dominant-Motion Segmentation - Multiple-Motion Segmentation. Motion Tracking: Graph-Based Spatio-Temporal Segmentation and Tracking - Kanade Lucas Tomasi Tracking - Mean-Shift Tracking - Active-Contour Tracking - 2D mesh Tracking.


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the student should be able to
1. Demonstrate sufficient understanding of video processing including video representation, video filtering and video compression.
2. Demonstrate the program basic video processing operations using the MATLAB.
3. Demonstrate a complete video processing system to achieve a specific task and analyze and interpret the system.

<table>
<thead>
<tr>
<th>Mapping with Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
</tr>
<tr>
<td>CO1</td>
</tr>
<tr>
<td>CO2</td>
</tr>
<tr>
<td>CO3</td>
</tr>
</tbody>
</table>
OPEN ELECTIVES
COURSE OBJECTIVES:

- To understand several key big data technologies used for storage, analysis and manipulation of data.
- To recognize the key concepts of Hadoop framework, MapReduce, Pig, Hive, Hadoop Ecosystem, R, and NoSQL.
- To prepare a sample big data project.

Introduction to Big Data: Big Data and its importance – Characteristics – Big data analytics – Basic requirements – Big data applications – Map Reduce framework – Algorithms using map reduce. NoSQL Databases: Key-value databases – Column-family databases – Document databases – Graph databases.


Case Studies: Social network analysis – Text analysis – Marketing analysis.

REFERENCES:


COURSE OUTCOMES:
At the end of this course, the students will be able to
1. categorize and summarize big data and its importance.
2. differentiate various big data technologies like Hadoop, MapReduce, Hadoop Ecosystem, R, and No-SQL.
3. apply tools and techniques to analyze big data.
4. earn tips and tricks for big data use cases and solutions.

<table>
<thead>
<tr>
<th>CSEE XOX</th>
<th>CLOUD COMPUTING TECHNOLOGIES</th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To understand the concepts of cloud and utility computing
- To understand the various issues in cloud computing
- To familiarize themselves with the lead players in cloud
- To appreciate the emergence of cloud as the next generation computing paradigm
- To be able to set up a private cloud


Management Virtualization — Hardware Maximization — Architectures — Virtualization Management — Storage Virtualization — Network Virtualization


Map Reduce Hadoop Distributed File Systems — Hadoop I/O — Developing Map Reduce Applications — Working of Map Reduce — Types and Formats — Setting up Hadoop Cluster


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the student should be able to
1. Articulate the main concepts, key technologies, strengths and limitations of cloud computing
2. Identify the architecture, infrastructure and delivery models of cloud computing
3. Explain the core issues of cloud computing such as security, privacy and interoperability
4. Choose the appropriate technologies, algorithms and approaches for the related issues
COURSE OBJECTIVES:
- To understand the fundamentals of wearable computing
- To introduce the Arduino software for wearable computing
- To understand the hardware and software requirements of Wearable computing

Arduino – Hardware hacking- How electricity works- Lilypad- Arduino Mini – Electronic components for soft prototyping

Arduino IDE – Installing the software – Using the IDE

Oft prototyping with LEDs – sewing a LED – soft push button – Hidden push button

The analog Zipper - Using an LDR - DC motors - servo motors


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Acquire knowledge of wearable computing
2. Understand the usage of Arduino software and its IDE
3. Understand the operation of hardware involved
4. Able to write the coding using Arduino software

COURSE OBJECTIVES:
- To understand the fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To apply the concept of Internet of Things in the real world scenario

Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoT vs M2M.
IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.

Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services.

Intel Galileo Gen2 with Arduino- Interfaces - Arduino IDE – Programming - APIs and Hacks.

Various Real time applications of IoT- Connecting IoT to cloud – Cloud Storage for Iot – Data Analytics for IoT – Software & Management Tools for IoT.

REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Design a portable IoT using Arduino/ equivalent boards and relevant protocols.
2. Develop web services to access/control IoT devices.
3. Deploy an IoT application and connect to the cloud.
4. Analyze applications of IoT in real time scenario

<table>
<thead>
<tr>
<th>CSEE XOX</th>
<th>MULTIMEDIA SYSTEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To understand various aspects of multimedia
- To represent image, video and audio
- To acquire knowledge in multimedia compression
- To study input, output and storage technologies of multimedia
- To learn hypermedia messaging and synchronization


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Acquire knowledge of different media streams in multimedia.
2. Compress image, video and audio.
3. Select suitable file formats and data structures.
4. Design user interfaces and develop interactive multimedia applications.

COURSE OBJECTIVES:
- To understand the issues in the design of web application development
- To learn the concepts of client side and server side technologies, three tier application using MVC and software components using EJB
- To understand and learn the importance of java based security solutions
- To learn the concept of frameworks


Web Application Development: Three tier architecture - Working with model - View - Controller - JCP - J2EE - XML based APIs - Application servers - Presentation tier and EIS tier - Java Mail - JMS - Java transactions - JNDI - Java authentication and authorization services - Java cryptography.

Component Based Development: Service Tier and Data tier - EJB architecture - Session beans - Entity beans - Message driven beans - J2EE connector architecture - Web Services - J2EE Web Services - Patterns – Presentation, service tier and Data tier patterns - J2ME - J2ME application development.


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Design and develop web applications using various models.
2. Develop Web applications using HTML and scripting technologies with advanced features.
3. Acquire knowledge of security features supported in java.
4. Develop web services using J2EE and related technologies.
COURSE OBJECTIVES:
- To learn about Java, HTML, DHTML concepts
- To know about server side programming
- Knowledge of XML and its applications

History of internet-Internet addressing-TCP/IP-DNS and directory services-Internet Applications-Electronic mail, New groups UUCP, FTP, Telnet, Finger.


Java Script Programming-Dynamic HTML-Cascading style sheets-Object model and Event model- Filters and Transitions-Active X Controls-Multimedia-Client side script.


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Understand the basic concepts of Internet programming and protocols used.
2. Create applications using HTML, DHTML, CSS and Java Script.
3. Develop applications using SERVLETS.
4. Work with JDBC, Web Databases and XML.
COURSE OBJECTIVES:

- Understand system requirements for Mobile Applications.
- Generate and implement suitable design using specific Mobile Development Frameworks.
- Convert existing web application into Mobile Applications with minimal effort.

Introduction to mobile applications - Embedded systems - Market and business drivers for mobile applications - Publishing and delivery of mobile applications - Requirements gathering and validation for mobile applications.

Introduction - Basics of embedded systems design - Embedded OS - Design constraints for mobile applications, both hardware and software related - Architecting mobile applications - User interfaces for mobile applications - touch events and gestures - Achieving quality constraints - performance, usability, security, availability and modifiability.

Designing applications with multimedia and web access capabilities - Integration with GPS and social media networking applications - Accessing applications hosted in a cloud computing environment - Design patterns for mobile applications.

Introduction - Establishing the development environment - Android architecture - Activities and views - Interacting with UI - Persisting data using SQLite - Packaging and deployment - Interaction with server side applications - Using Google Maps, GPS and Wifi - Integration with social media applications.

Introduction to iOS - iOS features - UI implementation - Touch frameworks - Data persistence using Core Data and SQLite - Location aware applications using Core Location and Map Kit - Integrating calendar and address book with social media application - Using Wifi - iPhone marketplace.

REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Describe the requirements for Mobile Applications
2. Explain the challenges in Mobile Application design and development
3. Develop design for Mobile Applications for specific requirements
4. Deploy Mobile Applications in Android and iPhone marketplace for distribution

COURSE OBJECTIVES:
- To familiarize with soft computing concepts.
- To introduce the ideas of Neural networks, fuzzy logic and use of heuristics based on human experience.
- To introduce the concepts of Genetic algorithm and its applications to soft computing.
- To gain insight onto Neuro Fuzzy modeling and control.


REFERENCES BOOKS:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Apply various soft computing frame works
2. Design of various neural networks
3. Use fuzzy logic
4. Apply genetic programming
5. Discuss hybrid soft computing

<table>
<thead>
<tr>
<th>CSEE XOX</th>
<th>HUMAN COMPUTER INTERACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

COURSE OBJECTIVES:
- To learn the design techniques and fundamentals of Human Computer Interaction (HCI)
- To know the various types of existing interfaces and evaluation techniques
- To understand the applications of HCI in emerging trends


REFERENCES:

COURSE OUTCOMES:
At the end of this course, the students will be able to
1. Understand the requirements and specifications for the interaction design.
2. Analyze the evaluation techniques of human interaction.
3. Able to design an efficient and user friendly human computer interface.
4. Determine the most appropriate HCI methods to meet the needs of a practical software development project.