M.TECH COMPUTER SCIENCE AND ENGINEERING

(DISTRIBUTED COMPUTING SYSTEMS)

(CBCS)

REGULATIONS, CURRICULUM AND SYLLABUS

(With effect from the Academic Year 2011 – 12)

PONDICHERRY UNIVERSITY
PUDUCHERRY – 605 014.
REGULATIONS FOR POST GRADUATE (M.Tech.) PROGRAMMES IN THE DISCIPLINE OF
Computer Science and Engineering (CBCS)
(WITH EFFECT FROM JULY 2011)

M.Tech. Computer Science and Engineering (DISTRIBUTED COMPUTING SYSTEMS)

1.0 ELIGIBILITY

M.Tech. in Computer Science and Engineering (Distributed Computing Systems): Candidates for admission to the first semester of four semester M.Tech. Course in Computer Science and Engineering with specialization in Distributed Computing Systems should have passed B.E./B.Tech. in Computer Science and Engineering / Information Technology or MCA through regular course of study from an AICTE approved institution (or) an examination of any University or Authority accepted by the Pondicherry University as equivalent thereto, with at least 55% marks in the degree examination or equivalent CGPA.

Note:
1. Candidates belonging to SC/ST who have a mere pass in the qualifying examination are eligible.
2. There is no age limit for M.Tech. programmes.

2.0 ADMISSION

The admission policy for various M.Tech. programmes shall be decided by the respective institutes offering M.Tech. programmes subject to conforming to the relevant regulations of the Pondicherry University.

3.0 STRUCTURE OF M.Tech. PROGRAMME

3.1 General

3.1.1 The M.Tech. Programmes are of semester pattern with 16 weeks of instruction in a semester.
3.1.2 The programme of instruction for each stream of specialization will consist of:
   (i) Core courses (Compulsory)
   (ii) Electives
   (iii) Laboratory
   (iv) Seminar
   (v) Directed Study
   (vi) Project work
3.1.3 The M.Tech. Programmes are of 4 semester duration.

3.1.4. Credits will be assigned to the courses based on the following general pattern:

(i) One credit for each lecture period
(ii) One credit for each tutorial period
(iii) Two credits for practical course
(iv) Two credits for seminar
(v) Twenty three credits for Project work divided into 9 credits for Phase-I and 14 credits for Phase – II

One teaching period shall be of 60 minutes duration including 10 minutes for discussion and movement.

3.1.5 Regulations, curriculum and syllabus of the M.Tech. programme shall have the approval of Board of Studies and other Boards/ Committees/ Councils, prescribed by the Pondicherry University. The curriculum should be so drawn up that the minimum number of credits and other requirements for the successful completion of the programme will be as given in Table – 1.

Table 1: Minimum credits and other requirements

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Description</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of semesters</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Min. number of credits of the programme</td>
<td>72</td>
</tr>
<tr>
<td>3</td>
<td>Max. number of credits of the programme</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>Min. Cumulative Grade Point Average for pass</td>
<td>5</td>
</tr>
</tbody>
</table>
| 5      | Min. successful credits needed for registering in the next semester | Sem. I: 10  
|        |                                                               | Sem. II: 25                  |
|        |                                                               | Sem. III: 40                 |
| 6      | Min. period of completion of programme (consecutive semesters) | 4                             |
| 7      | Max. period of completion of programme (consecutive semesters) | 8                             |
| 8      | Number of core and Elective courses                          | 12                            |
| 9      | Seminar                                                       | 1                             |
| 10     | Laboratory                                                    | 1                             |
| 11     | Directed study                                                | 1                             |
| 12     | Project work (semesters)                                     | 2                             |
3.1.6 A core course is a course that a student admitted to the M.Tech. programme must successfully complete to receive the degree. A student shall register for all the core courses listed in the curriculum. Core courses in a particular specialization are offered by the department concerned.

3.1.7 Elective courses are required to be chosen from the courses offered by the department(s) in that particular semester from among the approved courses. A core course of one department may be chosen as an elective by a student from other department.

3.1.8 Each student is required to make a seminar presentation on any chosen topic connected with the field of specialization. Preparation and presentation of a seminar is intended to investigate an in-depth review of literature, prepare a critical review and develop confidence to present the material by the student. The seminar shall be evaluated by a Department Committee constituted for this purpose, based on a report submitted by the candidate and a viva-voce conducted at the end of the semester.

3.1.9 Project work is envisaged to train a student to analyze independently any problem posed to him/her. The work may be analytical, experimental, design or a combination of both. The student can undertake the project work in the department concerned or in an industry/research laboratory approved by the Chairperson/Vice-Chairperson. The project report is expected to exhibit clarity of thought and expression. The evaluation of project work will be a continuous internal assessment based on two reviews, an internal viva-voce and an external viva-voce examination.

3.1.10 Directed study is a theory course required to be credited by each student under the close supervision of a faculty member of the department. The title of the course and syllabus are to be formulated by the designated faculty member and approved by the vice-chairperson, taking into account the broad area in which the student proposes to pursue his/her project work.

3.1.11 A student who has acquired the minimum number of total credits for the award of Degree will not be permitted to register for more courses for the purpose of improving his/her cumulative grade point average (see Table 1).

3.1.12 The medium of instruction, examination, seminar, directed study and project work will be in English.

3.2 Grading

3.2.1 Based on the performance of each student in a semester, letter grades will be awarded to each course at the end of the semester. The letter grades, the corresponding grade point and the description will be as shown in Table – 2.
TABLE 2: Letter Grade and the Corresponding Grade Point

<table>
<thead>
<tr>
<th>GRADE</th>
<th>POINTS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>10</td>
<td>EXCELLENT</td>
</tr>
<tr>
<td>A</td>
<td>9</td>
<td>VERY GOOD</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
<td>GOOD</td>
</tr>
<tr>
<td>C</td>
<td>7</td>
<td>ABOVE AVERAGE</td>
</tr>
<tr>
<td>D</td>
<td>6</td>
<td>AVERAGE</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>SATISFACTORY</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>FAILURE</td>
</tr>
<tr>
<td>FA</td>
<td>-</td>
<td>FAILURE DUE TO LACK OF ATTENDANCE/</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FAILURE BY ABSENCE</td>
</tr>
</tbody>
</table>

3.2.2 A student is deemed to have completed a course successfully and earned the appropriate credit if and only if, he/she receives a grade of E and above. The student should obtain 40% of marks in end-semester examination in a subject to earn a successful grade. A subject successfully completed cannot be repeated at any time.

3.2.3 The letter grades do not correspond to any fixed absolute mark. Each student is awarded a grade depending on his/her performance in relation to the performance of other students taking or have taken the course. For example, S does not mean he/she has secured 100% or 95%, but, rather that he/she is in the top 5% of all the students who have taken / are taking the course, in the judgement of the teachers. Grades shall be awarded based on the absolute marks in a meeting of the M.Tech Programme Committee to be held not later than 10 days after the last day of semester examination. Normally, not more than 5% of the students in any written/laboratory course shall be awarded the grade S and not more than one–third awarded A grade. Average marks in the class shall normally be C grade excepting in the case of practical/project where it may be B grade.

4.0 REGISTRATION

4.1 Each student, on admission, shall be assigned a Faculty Advisor, who shall advise the student about the academic programme and counsel him/her on the choice of courses depending on his/her academic background and objective.

4.2 With the advice and consent of the Faculty Advisor, the student shall register for courses he/she plans to take for the semester before the commencement of classes. No student shall be permitted to register for courses exceeding 30 contact hours per week nor shall any student be permitted to register for any course without satisfactorily completing the prerequisites for the course, except with the permission of the teacher concerned in the prescribed format.

4.3 If the student feels that he/she has registered for more courses than he/she can handle, he/she shall have the option of dropping one or more of the courses he/she has registered for, with the consent of his/her Faculty Advisor, before the end of 3rd
week of the semester. However, a student to retain his/her status should register for a minimum of 10 credits per semester.

4.4 Students, other than newly admitted, shall register for the courses of their choice in the preceding semester by filling in the prescribed forms.

4.5 The college shall prescribe the maximum number of students in each course taking into account the physical facilities available.

4.6 The college shall make available to all students a bulletin, listing all the courses offered in every semester specifying the credits, the prerequisites, a brief description or list of topics the course intends to cover, the faculty offering the course, the time and place of the classes for the course.

4.7 In any department, preference shall be given to those students for whom the course is a core-course, if, the demand for registration is beyond the maximum permitted number of students.

4.8 Normally, no course shall be offered unless a minimum of 3 students are registered.

5.0 EVALUATION

5.1 Evaluation of theory courses shall be based on 40% continuous internal assessment and 60% end-semester examination. Evaluation of laboratory course shall be based on 50% internal assessment and 50% end-semester examination. In each course, there shall be a 3 hour end-semester examination.

5.2 The seminar will be evaluated internally for 100 marks. The total marks for the project work will be 300 marks for phase-I and 400 marks for phase-II. The allotment of marks for external valuation and internal valuation shall be as detailed below:

Seminar( Internal valuation only): 100 Marks

<table>
<thead>
<tr>
<th>First review</th>
<th>30 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second review</td>
<td>30 marks</td>
</tr>
<tr>
<td>Report and Viva voce</td>
<td>40 marks</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100 marks</strong></td>
</tr>
</tbody>
</table>

Project work – (Phase – I): 300 Marks

<table>
<thead>
<tr>
<th>Internal valuation</th>
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<tbody>
<tr>
<td>Guide</td>
<td>50 marks</td>
</tr>
<tr>
<td>First Evaluation</td>
<td>50 marks</td>
</tr>
<tr>
<td>Second Evaluation</td>
<td>50 marks</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>150 marks</strong></td>
</tr>
</tbody>
</table>

External valuation

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http://cse.pec.edu
Evaluation (External Examiner Only)  |  50 marks  
Viva voce (50 for Ext. + 50 for Int.) |  100 marks  
**Total**                                  |  **150 marks**

**Project work – (Phase – II):**  400 Marks

<table>
<thead>
<tr>
<th>Internal valuation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Guide</td>
<td>100 marks</td>
</tr>
<tr>
<td>First Evaluation</td>
<td>50 marks</td>
</tr>
<tr>
<td>Second Evaluation</td>
<td>50 marks</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>200 marks</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External valuation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation (External Examiner Only)</td>
<td>50 marks</td>
</tr>
<tr>
<td>Viva voce (75 for Ext. + 75 for Int.)</td>
<td>150 marks</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>200 marks</strong></td>
</tr>
</tbody>
</table>

Internal valuation should be done by a committee comprising of not less than 3 faculty members appointed by the Vice-Chairperson.

5.3 The directed study shall be evaluated internally and continuously as detailed below:

- **Test I** : 15 Marks
- **Test II** : 15 Marks
- **Assignment** : 10 Marks
- **Final test covering the whole syllabus** : 60 Marks
- **Total** : 100 Marks

5.4 The end-semester examination shall be conducted by the department for all the courses offered by the department. Each teacher shall, in the 4th week of the semester, submit to the Vice-Chairperson, a model question paper for the end-semester examination. The end-semester paper shall cover the entire course.

5.5 The department shall invite 2 or 3 external experts for evaluating the end-semester examinations and grading. Each expert will be asked to set the question paper(s) for the course(s) he/she is competent to examine for the end-semester examination based on the model question paper submitted by the teacher concerned. The teacher and the expert concerned shall evaluate the answer scripts together and award the marks to the student. If, for any reason, no external expert is available for any paper, then, the teacher concerned shall set the question paper(s) for the end-semester examination, and the teacher himself/herself shall evaluate the papers and award the marks.

5.6 In the department, after the evaluation of the end-semester examination papers, all the teachers who handled the courses and the external experts together shall meet
with the M.Tech. Programme Committee (see 7.0) and decide the cut-offs for grades in each of the courses and award the final grades to the students.

5.7 Continuous internal assessment mark of 40 for a theory course shall be based on two tests (15 marks each) and one assignment (10 marks). A laboratory course carries an internal assessment mark of 50 distributed as follows: (i) Regular laboratory exercises and records – 20 marks (ii) Internal laboratory test – 20 marks and (iii) Internal viva-voce – 10 marks.

5.8 Every student shall have the right to scrutinize his/her answer scripts, assignments etc. and seek clarifications from the teacher regarding his/her evaluation of the scripts immediately after or within 3 days of receiving the evaluated scripts.

5.9 The department shall send all records of evaluation, including internal assessment for safe-keeping, to the college administration, as soon as all the formalities are completed.

5.10 At the end of the semester, each student shall be assigned a grade based on his/ her performance in each subject, in relation to the performance of other students.

5.11 A student securing F grade in a core course must repeat that course in order to obtain the Degree. A student securing F grade in an elective course may be permitted to choose another elective against the failed elective course, as the case may be, in consultation with the Faculty Adviser.

5.12 A student shall not be permitted to repeat any course(s) only for the purpose of improving the grade in a particular course or the cumulative grade point average (CGPA).

5.13 In exceptional cases, with the approval of the Chairperson, PG Programme committee, make–up examination(s) can be conducted to a student who misses end-semester examination(s) due to extreme medical emergency, certified by the college Medical Officer, or due to time-table clash in the end-semester examination between two courses he/she has registered for, in that semester.

5.14 All eligible students shall appear for end-semester examinations.

5.15 No student who has less than 75% attendance in any course will be permitted to attend the end-semester examinations. However, a student who has put in 60-75% attendance in any course and has absented on medical grounds will have to pay a condonation fee of Rs.200/- for each course and produce a medical certificate from a Government Medical Officer not below the rank of R.M.O. or officer of equal grade to become eligible to appear for the examinations. A student with less
than 60% attendance shall be given the grade of FA. He/ She shall have to repeat that course if it is a core course, when it is offered the next time.

6.0SUMMER TERM COURSE

6.1 A summer term course (STC) may be offered by the department concerned on the recommendations of M.Tech. Programme Committee. A summer term course is open only to those students who had registered for the course earlier and failed. No student should register for more than two courses during a summer term. Those students who could not appear for examination due to lack of attendance will not be allowed to register for the same course offered in summer, unless, certified by the Vice-Chairperson concerned and the Principal.

6.2 Summer term course will be announced at the end of even semester. A student has to register within the stipulated time by paying the prescribed fees.

6.3 The number of contact hours per week for any summer term course will be twice that of a regular semester course. The assessment procedure in a summer term course will be similar to the procedure for a regular semester course.

6.4 Withdrawal from a summer term course is not permitted.

7.0 M.Tech. PROGRAMME COMMITTEE

7.1 Every M.Tech. Programme shall be monitored by a committee constituted for this purpose by the college. Each committee shall consist of all teachers offering the courses for the programme and two student members or 10% of students enrolled whichever is less. The HOD or a senior faculty in the rank of a Professor shall be the Vice-Chairperson, nominated by the Head of the Institution. There shall be a common Chairperson in the Rank of Professor nominated by the Head of the Institution for all the P.G. programmes offered by the institute. There can be a common coordinator in the rank of Professor nominated by the Head of the Institution.

7.2 It shall be the duty and responsibility of the committee to review periodically the progress of the courses in the programme, discuss the problems concerning the curriculum and syllabi and conduct of classes. The committee may frame relevant rules for the conduct of evaluation.

7.3 The committee shall have the right to make suggestions to individual teachers on the assessment procedure to be followed for his/her course. It shall be open to the committee to bring to the notice of the Head of the Institution any difficulty encountered in the conduct of the classes or any other pertinent matter.
7.4 The committee shall meet at least twice a semester – first at the beginning of the semester, and second at the end of the semester. In the second meeting, the committee excluding student members but with the external experts invited by the Chairperson PG Programme Committee, shall finalize the grades of the students.

8.0 MINIMUM REQUIREMENTS

8.1 To be eligible towards continuing the Programme, a student must have earned a certain number of successful credits at the end of each semester as given in Table – 1. If he/she fails to satisfy this criterion in any semester, he/she shall be placed on scholastic probation in the succeeding semester. If he/she fails to earn the number of credits by the end of that year (including courses taken in summer), then, he/she shall be asked to discontinue the Programme.

8.2 Students are expected to abide by all the rules of the college and maintain a decorous conduct. Any deviation will be referred to the Head of the Institution for suitable action.

8.3 No student who has any outstanding dues to the college, hostel, library or laboratory or against whom any disciplinary action is contemplated/ pending, will be eligible to receive his/her degree.

9.0 DECLARATION OF RESULTS, RANK AND ISSUE OF GRADE CARD

9.1 The PG Programme(CBCS) office shall display the grades as soon as possible after the finalization of the grades. The student shall have the right, for a look at the evaluated examination scripts and represent to the M.Tech. Programme Committee for review if he/she feels aggrieved by the evaluation within a week from the commencement of succeeding semester classes.

9.2 The College shall issue at the beginning of each semester a grade card to the student, containing the grades obtained by the student in the previous semester(s) and his/her Grade Point Average (GPA) and his/her Cumulative Grade Point Average (CGPA).

9.3 The grade card shall list:
   a) title of the course(s) taken by the student.
   b) credits associated with each course.
   c) grade secured by the student.
   d) total credits earned by the student in that semester.
   e) GPA of the student.
   f) total credits earned by the student till that semester and
   g) CGPA of the student.

9.4 The GPA shall be calculated as the weighted average of the Grade Points weighted by the credit of the course as follows:
The product of the credit assigned to each course and the grade point associated with the grade obtained in the course is totaled over all the courses and the total is divided by the sum of credits of all the courses and rounded off to two decimal places.

For example, a student securing grade A in a 4 credit course, grade B in a 2 credit course, grade S in a 3 credit course and grade F in a 3 credit course, will have a GPA as:

\[
(9 \times 4 + 8 \times 2 + 10 \times 3 + 0 \times 3) / (4 + 2 + 3 + 3) = 82 / 12 = 6.83/10.0
\]

The sum will cover all the courses the student has taken in that semester, including those in which he/she has secured grade F. Grades FA are to be excluded for calculating GPA and CGPA.

9.5 For computing CGPA, the procedure described in 9.4 is followed, except, that the sum is taken over all the courses the student has studied in all the semesters till then. If a student has repeated any course, the grade secured by him/her in the successful attempt only will be taken into account for calculating CGPA.

9.6 To convert CGPA into percentage marks, the following formula shall be used:

\[
\% \text{ Mark} = (\text{CGPA} - 0.5) \times 10
\]

9.7 A candidate who satisfies the course requirements for all semesters and passes all the examinations prescribed for all the four semesters within a maximum period of 10 semesters reckoned from the commencement of the first semester to which the candidate was admitted shall be declared to have qualified for the award of degree.

9.8 A candidate who qualifies for the award of the degree shall be declared to have passed the examination in **FIRST CLASS with DISTINCTION** upon fulfilling the following requirements:

Should have passed all the subjects pertaining to semesters 1 to 4 in his/her first appearance in 4 consecutive semesters starting from first semester to which the candidate was admitted.

Should not have been prevented from writing examinations due to lack of attendance should have secured a CGPA of 8.50 and above for the semesters 1 to 4.

9.9 A candidate who qualifies for the award of the degree by passing all the subjects relating to semesters 1 to 4 within a maximum period of 6 consecutive semesters after his/her commencement of study in the first semester and in addition secures CGPA not less than 6.5 shall be declared to have passed the examination in **FIRST CLASS**.

9.10 All other candidates who qualify for the award of degree shall be declared to have passed the examination in **SECOND CLASS**.

9.11 A student with CGPA less than 5.0 is not eligible for the award of degree.
9.12 For the award of University rank and gold medal, the CGPA secured from 1st to 4th semester should be considered and it is mandatory that the candidate should have passed all the subjects from 1st to 4th semester in the first appearance and he/she should not have been prevented from writing the examination due to lack of attendance and should not have withdrawn from writing the end-semester examinations.

10.0 PROVISION FOR WITHDRAWAL

A candidate may, for valid reasons, and on the recommendation of the vice-chairperson and chairperson be granted permission by the Head of the Institution to withdraw from writing the entire semester examination as one unit. The withdrawal application shall be valid only if it is made earlier than the commencement of the last theory examination pertaining to that semester. Withdrawal shall be permitted only once during the entire programme. Other conditions being satisfactory, candidates who withdraw are also eligible to be awarded DISTINCTION whereas they are not eligible to be awarded a rank/ gold medal.

11.0 TEMPORARY DISCONTINUATION FROM THE PROGRAMME

If a candidate wishes to temporarily discontinue the programme for valid reasons, he/she shall apply to the Chairperson, PG Programme committee, through the Head of the department in advance and secure a written permission to that effect. A candidate after temporary discontinuance may rejoin the programme only at the commencement of the semester at which he/she discontinued, provided he/she pays the prescribed fees. The total period of completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall not in any case exceed 8 consecutive semesters including the period of discontinuance.

12.0 POWER TO MODIFY

12.1 Notwithstanding anything contained in the foregoing, the Pondicherry University shall have the power to issue directions/orders to remove any difficulty.

12.2 Nothing in the foregoing may be construed as limiting the power of the Pondicherry University to amend, modify or repeal any or all of the above.

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# M.TECH COMPUTER SCIENCE AND ENGINEERING
(Distributed Computing Systems)

## CURRICULUM AND SCHEME OF EXAMINATION
(Total number of credits required for the completion of the programme: 72)

### SEMESTER – I

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Evaluation (marks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L  T  P</td>
<td></td>
<td>Internal  External  Total</td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td>CORE - I</td>
<td>3 1 0</td>
<td>4</td>
<td>40 60 100</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>CORE - II</td>
<td>3 1 0</td>
<td>4</td>
<td>40 60 100</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>CORE - III</td>
<td>3 1 0</td>
<td>4</td>
<td>40 60 100</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>Elective – I</td>
<td>3 0 0</td>
<td>3</td>
<td>40 60 100</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Elective – II</td>
<td>3 0 0</td>
<td>3</td>
<td>40 60 100</td>
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<tr>
<td>6.</td>
<td></td>
<td>Elective – III</td>
<td>3 0 0</td>
<td>3</td>
<td>40 60 100</td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>CS 941 Seminar / Laboratory – I</td>
<td>- - 3</td>
<td>2</td>
<td>100 - 100</td>
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<td></td>
<td></td>
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<td>23 340 360 700</td>
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</table>

### SEMESTER – II

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>Evaluation (marks)</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td>L  T  P</td>
<td></td>
<td>Internal  External  Total</td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td>CORE - IV</td>
<td>3 1 0</td>
<td>4</td>
<td>40 60 100</td>
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<tr>
<td>2.</td>
<td></td>
<td>CORE - V</td>
<td>3 1 0</td>
<td>4</td>
<td>40 60 100</td>
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<tr>
<td>3.</td>
<td></td>
<td>CORE - VI</td>
<td>3 1 0</td>
<td>4</td>
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</tr>
<tr>
<td>4.</td>
<td></td>
<td>Elective – IV</td>
<td>3 0 0</td>
<td>3</td>
<td>40 60 100</td>
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<tr>
<td>5.</td>
<td></td>
<td>Elective – V</td>
<td>3 0 0</td>
<td>3</td>
<td>40 60 100</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Elective – VI</td>
<td>3 0 0</td>
<td>3</td>
<td>40 60 100</td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>CS 942 Laboratory - II</td>
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## SEMESTER – III

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## SEMESTER – IV

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## LIST OF CORE SUBJECTS

- **CS901** DESIGN OF DISTRIBUTED SYSTEMS
- **CS902** INFRASTRUCTURE FOR DISTRIBUTED SYSTEMS
- **CS903** ADVANCES IN DATABASE SYSTEMS
- **CS904** HIGH PERFORMANCE NETWORKS
- **CS905** CLOUD AND UTILITY COMPUTING
- **CS906** NETWORK MANAGEMENT AND SECURITY
LIST OF ELECTIVE SUBJECTS:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CS911</td>
<td>ADVANCED COMPUTER ARCHITECTURE</td>
</tr>
<tr>
<td>CS912</td>
<td>EVOLUTIONARY COMPUTING</td>
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<td>CS913</td>
<td>MOBILE COMPUTING</td>
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<td>CS914</td>
<td>INTELLIGENT INFORMATION RETRIEVAL</td>
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<td>CS915</td>
<td>REAL-TIME SYSTEMS</td>
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<td>CS916</td>
<td>WEB SERVICES AND INTERNET ENGINEERING</td>
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<tr>
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<td>MACHINE LEARNING</td>
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<td>DATA COMPRESSION</td>
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<td>CS926</td>
<td>DATA MINING AND DATA WARE HOUSING</td>
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<td>CS930</td>
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<td>CS934</td>
<td>ETHICAL HACKING</td>
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</table>
CS 901 DESIGN OF DISTRIBUTED SYSTEMS

UNIT - I

UNIT - II

UNIT- III

UNIT- IV

UNIT-V

REFERENCES

CS902 DESIGN OF DISTRIBUTED SYSTEMS INFRASTRUCTURE

UNIT-I
Introduction to Client/Server Computing  - Client/Server Building Blocks - The Road to Bandwidth.
Clients, Servers, and Operating Systems - Commercial OS - Comparison of OS

UNIT-II
Base Middleware: Stacks and NOSs -NOS: Creating the Single-System Image - RPC, Messaging, and Peer-to-Peer - NOS: existing commercial and open source solutions.
SQL Database Servers :- SQL Database Servers - SQL Middleware and Federated Databases - Data Warehouses: Information source - EIS/DSS: From Queries, To OLAP, to Data Mining - existing commercial and open source solutions

UNIT-III
Client/Server Transaction Processing : The basics of Transactions - TP Monitors: Managing Client/Server Transactions - TP-Lite or TP-Heavy - TP Monitors - existing commercial and open source solutions.
Client/Server Groupware: Client/Server Groupware - Groupware: existing commercial and open source solutions

UNIT-IV
Client/Server With Distributed Objects: Distributed Objects and Components- CORBA: From ORBs To Enterprise Beans - COM+: The Other Component Bus - Object Databases - Distributed Objects: existing commercial and open source solutions

UNIT-V
Distributed System Management - Client/Server Distributed System Management - Distributed System Management Standards
Bringing It All Together - Client/Server Tools and Application Development - Future Directions

REFERENCES
CS903 ADVANCES IN DATABASE SYSTEMS

UNIT – I
Overview of Existing DBMS Models- Introduction to commercial and open source database systems- Need for Special databases like multimedia, embedded, web, spatial, temporal databases-JDBC-ODBC.

UNIT – II

UNIT – III

UNIT – IV

UNIT – V

REFERENCES
CS904 HIGH PERFORMANCE NETWORKS

UNIT- I

UNIT- II

UNIT- III

UNIT-IV

UNIT- V

REFERENCES


http://cse.pec.edu
CS905 CLOUD AND UTILITY COMPUTING

UNIT-I

UNIT-II
Federation in the Cloud - Presence in the Cloud - Privacy and its Relation to Cloud-Based Information Systems – Security in the Cloud - Common Standards in the Cloud – End-User Access to the Cloud Computing

UNIT –III

UNIT-IV

UNIT-V

REFERENCES

http://cse.pec.edu
CS906 NETWORK MANAGEMENT AND SECURITY

UNIT-I


UNIT-II


UNIT-III

System Identification and clustering: Cryptology of speech signals – narrow band and wide band systems – Analogue & Digital Systems of speech encryption.

UNIT-IV


UNIT-V

Telecommunication Network Architecture, TMN management layers, Management information Model, Management servicing and functions, Structure of management information and TMN information model, SNMP v1, SNMP2 & SNMP3, RMON1 & 2, Broadband Network Management (ATM, HFC, DSL), ASN

REFERENCES


http://cse.pec.edu
CS911 ADVANCED COMPUTER ARCHITECTURE

UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V
Parallel Models, Languages and Compilers - Parallel Programming Models, Parallel Languages and Compilers. Dependence Analysis of Data Arrays, Code Optimization and Scheduling, Loop Parallelization and Pipelining. Parallel Program Development and Environments - Parallel programming Environments, Synchronization and Multiprocessing Models, Shared-Variable Program Structures, Message-Passing program Development, Mapping Programs onto Multicomputers.

REFERENCES

http://cse.pec.edu


CS 912 EVOLUTIONARY COMPUTING

UNIT – I

UNIT- II

UNIT – III

UNIT – IV

UNIT – V

REFERENCES:

CS913 MOBILE COMPUTING

UNIT - I

UNIT – II

UNIT - III

UNIT - IV

UNIT - V

REFERENCES

CS914 INTELLIGENT INFORMATION RETRIEVAL

UNIT - I
Knowledge representation - Basics of Prepositional logic- Predicate logic-reasoning using first order logic-unification-forward chaining-backward chaining-resolution- -Production rules-frames-semantic networks- scripts.

UNIT - II
Ontology Development - Description logic-taxonomies-Topic maps-Ontology-Definition-expressing ontology logically-ontology representations-XML-RDF-RDFS-OWL-OIL-ontology development for specific domain-ontology engineering-Semantic web services

UNIT - III
Parallel and distributed IR- multimedia IR- data modeling-query languages-.Web Searching Basics-Characterizing the Web-Search Engines-Web crawling and in dexex-link analysis.

UNIT - IV

UNIT - V
Language models for information retrieval-text classification,Naïve bayes-vector space classification-support vector machines and machine learning on documents-flat clustering-hirarchical clustering

REFERENCES
CS915 REAL-TIME SYSTEMS

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V

REFERENCES

CS916 WEB SERVICES AND INTERNET ENGINEERING

UNIT – I

UNIT – II
Web services, Evolution and differences with Distributed computing, XML - Name Spaces - Structuring With Schemas and DTD - Transformation - XML Infrastructure WSDL, SOAP, UDDI, ebXML - SOAP And Web Services in E-Com - Overview Of .NET And J2EE.

UNIT - III

UNIT - IV

UNIT - V

REFERENCES


CS917 MACHINE LEARNING

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V

REFERENCES
CS918 DATA COMPRESSION

UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V

REFERENCES


CS919 AGENT TECHNOLOGY

UNIT - I
Introduction to agents – Abstract architectures for intelligent agents – Concrete architecture for intelligent agents – Agent Programming languages Multi-agent Systems and societies of Agents – Agent Communications – Agent Interaction Protocols.

UNIT - II

UNIT - III

UNIT - IV

UNIT - V
Agents Development frameworks and languages – Development tools – applications of agents. Agent Oriented methodologies – Agent oriented analysis and design, Gaia methodology, MASE, OPEN process framework, Tropos, Agent UML.

REFERENCES
CS920 ADVANCED JAVA PROGRAMMING

UNIT - I
JAVA Basics - Java streaming - Networking - Event handling - Multithreading - Byte code Interpretation - Customizing application - Data Structures - Collection classes.

UNIT - II

UNIT - III
JAVA Beans and Swing - Bean concepts - Events in bean box - Bean customization - Persistence - Application - deployment using swing - Advanced swing techniques - JAR file handling.

UNIT - IV
JAVA e-Applications - JNI - Servlets - Java Server Pages - JDBC - Session beans - Entity beans - Programming and deploying enterprise Java Beans - Java transactions.

UNIT - V
Related JAVA Techniques - Java Media Frame work - 3D graphics - Internationalization - Case study - Deploying n-tier application, E-commerce applications.

REFERENCES
CS921 OPTICAL COMMUNICATION NETWORKS

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V

REFERENCES
CS922 SOFTWARE ARCHITECTURE

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V
Architecture of Graphical User Interfaces - Evolution of User Interfaces -Look-and-Feel (Syntax) of User Interfaces-Usability (Semantics) of User Interfaces-Design Considerations of User Interfaces-Enabling Technology-Direct Manipulation-Evaluation of

REFERENCES


CS923 ADVANCES IN SOFTWARE ENGINEERING

UNIT - I

Introduction to Patterns - Application of Patterns

UNIT - II

Measurement and Experimentation: Introduction- the basics of measurement-goal based frame work for measurement-empirical investigation-software metrics data collection – analyzing software measurement data.

UNIT - III


UNIT - IV

Distributed Software Engineering: Distributed systems issues- Client—server computing-Architectural patterns for distributed systems-Software as a service.
Service-oriented Architecture- Services as reusable components-Service engineering-Software development with services.
Embedded Systems: Embedded systems design- Architectural patterns-Timing analysis. Real time operating systems.

UNIT - V

Web engineering: An introduction to web engineering-Requirements engineering for web application-Modeling web applications-web application architecture-technology aare web application Design –Testing web application-web application development process-performance of web applications
REFERENCES


CS924 SYSTEMS PERFORMANCE EVALUATION

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V
Linear Regression Models – Distributions: Bernoulli, Binomial, Chi-Square, Exponential, Geometric, Normal, Pareto, Poisson, Student’s t, Continuous and Discrete Uniform – Relationships among distributions – Queuing Theory – Notation – Rules – Little’s Law –
REFERENCES


CS925 DISTRIBUTED ALGORITHMS

UNIT – I

UNIT – II

UNIT – III
Asynchronous Network Algorithms: Asynchronous Network Model; Basic Asynchronous Network Algorithms, Synchronizers, Shared Memory versus Networks, Logical Time, Global Snapshots and Stable properties.

UNIT – IV

UNIT – V

http://cse.pec.edu
REFERENCES


CS926 DATA MINING AND DATA WAREHOUSING

UNIT – I
Relation to statistics, databases, machine learning - Taxonomy of data mining tasks - Steps in data mining process - Overview of data mining techniques.

UNIT - II
Visualization and statistical perspective Visualization - Dimension reduction techniques - Data summarization methods - Statistical Perspective - Probabilistic - Deterministic models - Clustering - Regression analysis - Time series analysis - Bayesian learning.

UNIT - III
Predictive modeling - Predictive Modeling - Classification - Decision trees - Patterns - Association rules - Algorithms.

UNIT - IV

UNIT - V

REFERENCES

CS927 MULICORE ARCHITECTURE AND PROGRAMMING

UNIT - I

UNIT - II

UNIT - III
Cell Broad band engine architecture, PPE (Power Processor Element), SPE (Synergistic processing element), Cell Software Development Kit, Programming for Multicore architecture.

UNIT - IV

UNIT - V

REFERENCES

CS928 AD HOC AND SENSOR NETWORKS

UNIT - I

UNIT - II

UNIT - III

UNIT - IV

UNIT - V
REFERENCES


CS929 REINFORCEMENT LEARNING

UNIT - I


UNIT - II


UNIT - III


UNIT - IV


UNIT - V

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REFERENCES


CS930 DESIGN OF EMBEDDED SYSTEMS

UNIT - I

Embedded Computing - Challenges of Embedded Systems – Embedded system design process. Embedded processors – ARM processor – Architecture, ARM and Thumb Instruction sets

UNIT - II


UNIT - III


UNIT - IV

Processes and Operating systems - Multiple tasks and processes – Context switching – Scheduling policies – Interprocess communication mechanisms – Exception and interrupt handling - Performance issues.

UNIT - V

Embedded System Development - Meeting real time constraints – Multi-state systems and function sequences. Embedded software development tools – Emulators and debuggers. Design methodologies – Case studies – Windows CE – Linux 2.6x and RTLinux – Coding
and sending application layer byte stream on a TCP/IP network using RTOS Vxworks – Embedded system for a smart card.

REFERENCES


CS931 SERVICE ORIENTED ARCHITECTURE

UNIT - I
Fundamental SOA-Common characteristics of contemporary SOA- Common misperceptions about SOA-Common tangible benefits of SOA- Common pitfalls of adopting SOA - An SOA timeline The continuing evolution of SOA - The roots of SOA (comparing SOA to past architectures). The Web services framework- Services Service descriptions (with WSDL)-Messaging

UNIT - II

UNIT - III
Principles of Service-Orientation-Service-orientation and the enterprise- Anatomy of a service-oriented architecture- Common principles of service-orientation- How service-orientation principles inter-relate-Section-Service-orientation and object-orientation- Native Web service support for service-orientation principles. Service Layers -Service-orientation and contemporary SOA- Service layer abstraction-application service layer-Business service layer- Orchestration service layer-Agnostic services- Service layer configuration scenarios.

UNIT - IV
Building SOA - SOA Delivery Strategies- SOA delivery lifecycle phases- The top-down strategy- The bottom-up strategy- The agile strategy. Introduction to service-oriented analysis- Benefits of a business-centric SOA- Deriving business services-Service Modeling -Service modeling -Service modeling guidelines- Classifying service model logic- Contrasting service modeling approaches

http://cse.pec.edu
UNIT - V
Service-Oriented Design - Introduction to service-oriented design- WSDL-related XML Schema language basics- WSDL language basics- SOAP language basics- Service interface design tools. SOA Composition Guidelines - Steps to composing SOA-Considerations for choosing service layers and SOA standards, positioning of cores and SOA extensions.
Service Design -Overview-Service design of business service, application service, task centered service and guidelines. Business Process Design - WS-BPEL language basics-WS-Coordination overview- Service-oriented business process design

REFERENCES

CS932 DISTRIBUTED SYSTEM SECURITY

UNIT – I

UNIT – II

UNIT - III

UNIT - IV

UNIT - V

REFERENCES


CS933 TRUSTED INTERNET

UNIT - I


UNIT - II


UNIT - III


UNIT - IV

E-Commerce Security: SET for E- Commerce Transactions, Business requirements for SET, SET System Participants, Dual Signature and Signature, Authentication and Message Integrity, Payment Processing.

UNIT - V


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REFERENCES


CS934 ETHICAL HACKING

UNIT - I

UNIT - II

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UNIT - IV

http://cse.pec.edu

UNIT - V


REFERENCES

**Infrastructure and Faculty requirements for M.Tech(CSE-DCS)**

**Faculty–student ratio:** 1:12 (As per AICTE norms for intake of 25: 1 Professor, 1 Associate Professor, 2 Assistant Professors)

**Class room Equipment:** Multimedia Projector, Black Board

**Teacher qualification Specialization:** M.Tech. in Computer Science and Engineering

**Class Room:** 1 area of 30 sq.m

**Laboratory: 1**

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<td>UPS</td>
<td>Minimum of 5 KVA</td>
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<td>Printer</td>
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<td>Software</td>
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<td>2. Proprietary/ open source clientS</td>
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<td>3. Borland C Compiler / Microsoft C compiler/ any open source C compiler/ any Proprietary C compiler</td>
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<td>4. Java development Kit (Latest Version)</td>
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<td>6. DB2 Server / ORACLE server/ SQL Server/ Open source DBMS server software</td>
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<td>7. Network simulator</td>
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<td>8. Open MP</td>
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