# M.Tech Computer Science & Technology

## Course Structure and Scheme of Valuation w.e.f. 2013-14

### I SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Periods/week</td>
<td>Theory Lab</td>
<td>Ext.</td>
<td>Int.</td>
<td></td>
</tr>
<tr>
<td>MTCST1.1</td>
<td>Mathematical Foundations of Computer Science</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST1.2</td>
<td>Data Structures &amp; Algorithms</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST1.3</td>
<td>Data Base Management Systems</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST1.4</td>
<td>Computer Organization &amp; Architecture</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST1.5</td>
<td>Advanced Operating Systems</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST1.6</td>
<td>Computer Networks</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST1.7</td>
<td>Data Structures &amp; Programming Lab</td>
<td>- 3    50</td>
<td>50</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>MTCST1.8</td>
<td>Database Management Systems Lab</td>
<td>- 3    50</td>
<td>50</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>18 6</strong></td>
<td><strong>520 280</strong></td>
<td><strong>800 28</strong></td>
<td></td>
</tr>
</tbody>
</table>

### II SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Periods/week</td>
<td>Theory Lab</td>
<td>Ext.</td>
<td>Int.</td>
<td></td>
</tr>
<tr>
<td>MTCST2.1</td>
<td>Artificial Intelligence</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST2.2</td>
<td>Object Oriented Software Engineering</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST2.3</td>
<td>Compiler Design</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST2.4</td>
<td>Data ware Housing &amp; Data Mining</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST2.5</td>
<td>Elective I</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST2.6</td>
<td>Elective II</td>
<td>3 -    70</td>
<td>30</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCST2.7</td>
<td>Network Programming &amp; Web Programming Lab</td>
<td>- 3    50</td>
<td>50</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>MTCST2.8</td>
<td>OOSE Lab</td>
<td>- 3    50</td>
<td>50</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>18 6</strong></td>
<td><strong>520 280</strong></td>
<td><strong>800 28</strong></td>
<td></td>
</tr>
</tbody>
</table>


**Elective II:** Cloud Computing/ Mobile Computing/ Soft Computing/ Grid Computing/ Cluster Computing/ Pervasive Computing
# M.Tech Information Technology

## Course Structure and Scheme of Valuation w.e.f. 2013-14

### I SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTIT1.1</td>
<td>Mathematical Foundations of Computer Science</td>
<td>3</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>MTIT1.2</td>
<td>Data Structures &amp; Algorithms</td>
<td>3</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>MTIT1.3</td>
<td>Data Base Management Systems</td>
<td>3</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>MTIT1.4</td>
<td>Computer Organization &amp; Architecture</td>
<td>3</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>MTIT1.5</td>
<td>Advanced Operating Systems</td>
<td>3</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>MTIT1.6</td>
<td>Computer Networks</td>
<td>3</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>MTIT1.7</td>
<td>Data Structures &amp; Programming Lab</td>
<td>-</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>MTIT1.8</td>
<td>Database Management Systems Lab</td>
<td>-</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>18</td>
<td>6</td>
<td>520</td>
</tr>
</tbody>
</table>

### II SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTIT2.1</td>
<td>Web Systems &amp; Technologies</td>
<td>3</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>MTIT2.2</td>
<td>Object Oriented Software Engineering</td>
<td>3</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>MTIT2.3</td>
<td>Information Security &amp; Cryptography</td>
<td>3</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>MTIT2.4</td>
<td>Wireless &amp; Mobile Networks</td>
<td>3</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>MTIT2.5</td>
<td>Elective I</td>
<td>3</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>MTIT2.6</td>
<td>Elective II</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>MTIT2.7</td>
<td>Network Programming &amp; Web Programming Lab</td>
<td>3</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>MTIT2.8</td>
<td>OOSE Lab</td>
<td>3</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>18</td>
<td>6</td>
<td>520</td>
</tr>
</tbody>
</table>

**Elective I:** Social & Media Analysis/ E-Commerce/ Mathematics Of Internet Systems & Control/IT Infrastructure Planning Management/ Geo-informatics/ Data Base Security/Business Intelligence/Big Data analysis

**Elective II:** Cloud Computing/ Mobile Computing/Soft Computing/ Grid Computing/Cluster Computing/ Pervasive Computing
# M. Tech Computer Science & Technology with a Specialization in Artificial Intelligence & Robotics

Course Structure and Scheme of Valuation w.e.f. 2013-14

## I SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTCSTAIR1.1</td>
<td>Mathematical Foundations of Computer Science</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR1.2</td>
<td>Data Structures &amp; Algorithms</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR1.3</td>
<td>Data Base Management Systems</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR1.4</td>
<td>Computer Organization &amp; Architecture</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR1.5</td>
<td>Advanced Operating Systems</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR1.6</td>
<td>Introduction to Robotics</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR1.7</td>
<td>Data Structures &amp; Programming Lab</td>
<td>-</td>
<td>3</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>MTCSTAIR1.8</td>
<td>Robotics Lab</td>
<td>-</td>
<td>3</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>18</strong></td>
<td><strong>520</strong></td>
<td><strong>280</strong></td>
<td><strong>800</strong></td>
</tr>
</tbody>
</table>

## II SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTCSTAIR2.1</td>
<td>Artificial Intelligence</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR2.2</td>
<td>Neural Networks &amp; Fuzzy Systems</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR2.3</td>
<td>Expert Systems</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR2.4</td>
<td>Data ware Housing &amp;Data Mining</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR2.5</td>
<td>Advanced Robotics</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR2.6</td>
<td>Elective</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTAIR2.7</td>
<td>AI &amp; Expert Systems Lab</td>
<td>-</td>
<td>3</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>MTCSTAIR2.8</td>
<td>Data Mining Lab</td>
<td>-</td>
<td>3</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>18</strong></td>
<td><strong>520</strong></td>
<td><strong>280</strong></td>
<td><strong>800</strong></td>
</tr>
</tbody>
</table>

Elective I: Pattern Recognition/Image Processing/Semantic Web/Computer Vision /Big Data Analysis
# M.Tech Computer Science & Technology with a Specialization in Bioinformatics

## Course Structure and Scheme of Valuation w. e. f. 2013-14

### I SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the Subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTCSTBI1.1</td>
<td>Mathematical Foundations of Computer Science</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTBI1.2</td>
<td>Data Structures &amp; Algorithms</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTBI1.3</td>
<td>Data Base Management Systems</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTBI1.4</td>
<td>Computer Organization &amp; Architecture</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTBI1.5</td>
<td>Advanced Operating Systems</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTBI1.6</td>
<td>Fundamentals of Bioinformatics</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCSTBI1.7</td>
<td>Data Structures &amp; Programming Lab</td>
<td>-</td>
<td>3</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>MTCSTBI1.8</td>
<td>Bioinformatics Lab</td>
<td>-</td>
<td>3</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>18</strong></td>
<td><strong>520</strong></td>
<td><strong>280</strong></td>
<td><strong>800</strong></td>
</tr>
</tbody>
</table>

### II SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the Subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTCST2.1</td>
<td>Artificial Intelligence</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCST2.2</td>
<td>Bioinformatics Algorithms</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCST2.3</td>
<td>Data Mining For Bioinformatics</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCST2.4</td>
<td>Techniques for Bioinformatics</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCST2.5</td>
<td>Genetic Algorithms</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCST2.6</td>
<td>Elective</td>
<td>3</td>
<td>70</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>MTCST2.7</td>
<td>Computational Biology Lab</td>
<td>-</td>
<td>3</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>MTCST2.8</td>
<td>Perl Programming Lab</td>
<td>-</td>
<td>3</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>18</strong></td>
<td><strong>520</strong></td>
<td><strong>280</strong></td>
<td><strong>800</strong></td>
</tr>
</tbody>
</table>

**Elective:** Geno-Informatics/Semantic Web/Fuzzy Systems/ Modeling of Protein Structures /Big Data Analysis
M.Tech Computer Science & Technology with a Specialization in Computer Networks
Course Structure and Scheme of Valuation w.e.f. 2013-14

I SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTCSTCN1.1</td>
<td>Mathematical Foundations of Computer Science</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSTCN1.2</td>
<td>Data Structures &amp; Algorithms</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSTCN1.3</td>
<td>Data Base Management Systems</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSTCN1.4</td>
<td>Computer Organization &amp; Architecture</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSTCN1.5</td>
<td>Advanced Operating Systems</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSTCN1.6</td>
<td>Computer Networks</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSTCN1.7</td>
<td>Data Structures &amp; Programming Lab</td>
<td>- 3</td>
<td>50</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>MTCSTCN1.8</td>
<td>Computer Networks Lab</td>
<td>- 3</td>
<td>50</td>
<td>100</td>
<td>2</td>
</tr>
</tbody>
</table>

Total 18 6 520 280 800 28

II SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTCSTCN2.1</td>
<td>Internet Technologies</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSCNT2.2</td>
<td>Network Technologies</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSTCN2.3</td>
<td>Sensor Networks</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSTCN2.4</td>
<td>Wireless Networks</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSTCN2.5</td>
<td>TCP/IP</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSTCN2.6</td>
<td>Elective</td>
<td>3 -</td>
<td>70</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>MTCSTCN2.7</td>
<td>Wireless Networks Lab</td>
<td>- 3</td>
<td>50</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>MTCSTCN2.8</td>
<td>Protocol Development Lab</td>
<td>- 3</td>
<td>50</td>
<td>100</td>
<td>2</td>
</tr>
</tbody>
</table>

Total 18 6 520 280 800 28

Elective: Multi Media Networks/Network Management Systems/Performance Analysis of Network Architecture/
### III SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTCST 3.1</td>
<td>Seminar</td>
<td>-</td>
<td>100</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>MTCST3.2</td>
<td>Thesis Work Part 1</td>
<td>Grade</td>
<td>Grade</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>12</strong></td>
</tr>
</tbody>
</table>

1. Candidates can do their thesis work within the department or in any industry/research organization for two semesters (i.e. 3rd and 4th semesters). In case of thesis done in an industry/research organization, one advisor (Guide) should be from the department and one advisor(CO-Guide) should be from the industry/research organization.
2. Thesis part I should be submitted at the end of 3rd semester and it will be evaluated by a committee consisting of Chairman Board of Studies, Head of the Department and thesis guide.
3. The candidate should give one seminar in III semester on his research work/advanced topics in the related fields. Seminar marks & credits are evaluated internally by the guide and added to the CGPA.
4. Although credits are allotted for the thesis work they will not be taken for the calculation of CGPA.

### IV SEMESTER

<table>
<thead>
<tr>
<th>Code</th>
<th>Name of the subject</th>
<th>Periods/week</th>
<th>Max. Marks</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTCST 3.1</td>
<td>Seminar</td>
<td>-</td>
<td>100</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td>MTCST3.2</td>
<td>Thesis Work Part 2</td>
<td>Grade</td>
<td>Grade</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>17</strong></td>
</tr>
</tbody>
</table>

1. The candidate should give one seminar in the IV Semester on his research before submission of the thesis. Seminar marks & credits are evaluated internally by the guide and added to the CGPA.
2. A publication of a paper on the thesis work in a National/International Conference proceedings with presentation certificate or a paper on the thesis work be communicated to a National/International Journal & accepted for publication for the submission of thesis at the end of 4th semester is mandatory.
3. Final Thesis with Part I & Part II should be submitted at the end of 4th semester and it will be evaluated by a committee consisting of Chairman Board of Studies, Head of the Department, External Examiner and thesis guide.
4. The candidate has to defend his thesis in a Viva-voce examination to be conducted by the above committee. The committee should submit a report, with signatures of all the members, candidate wise, with grade A-Excellent/ Grade B-Good/Grade C-fair/ Grade D-Reappear.
5. The external examiner shall be nominated by the Hon’ble Vice Chancellor as per the norms of the University.
6. Although credits are allotted for the thesis work they will not be taken for the calculation of CGPA.
Detailed Syllabus for M.Tech First Semester

MTCST 1.1  MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
Common with M. Tech (CST, IT, CSTAIR, CSTBI, CSTCN)

Instruction: 3 Periods/week  Time: 3 Hours  Credits: 4

Internal: 30 Marks  External: 70 Marks  Total: 100 Marks

1. Mathematical notions of sets, sequences and tuples, functions and relations, Primitive recursive functions, computable functions, examples, graphs, strings and languages,

2. Boolean logic – properties and representation, theorems and types of proofs, deductive, inductive, by construction, contradiction and counter-examples.

3. Introduction to Number theory, Divisibility, modular arithmetic (addition modulo and multiplication modulo); Statements and applications of Euler and Fermat Theorems, Primitive Roots, Discrete Logarithms, Primality Test, Finding Large primes, Definition of Elliptic Curves and their applications to Cryptography.


6. Turing Machines: The Definition of Turing Machine – Computing with Turing Machines – Combining Turing Machines, , programming techniques for Turing Machines,

7. Variants of Turing Machines, Restricted Turing Machines Universal Turing Machines. The Halting Problem, Decidable & undecidable problems- Post Correspondence Problems

Text books:

1. Introduction to Automata Theory, Languages and Computations – J.E. Hopcroft, & J.D. Ullman , Pearson Education Asia.

Reference books:

1. Introduction to languages and theory of computation – John C. Martin (MGH)
2. Discrete Mathematical structures with application to Computer Science – J.P. Tremblay and R. Manohar
3. Introduction to Theory of Computation – Michael Sipser (Thomson Nrools/Cole)
1. INTRODUCTION:
Overview of C++ classes, pointers, parameters passing, templates, using Matrices.

2. ALGORITHM ANALYSIS:
Basics of time complexity estimates, General norms for running time calculation

3. LISTS, STACKS & QUEUES:
Abstract Data Types, Representation & implementation of ADT list, Doubly linked list, Circular linked lists, Representation, Implementation and applications of ADT stack and Queue.

4. TREES:

5. HASHING:
Hash Function, Separate chains, Open addressing, rehashing, Extendible Hashing.

6. INTERNAL SORTING ALGORITHMS:
Sorting like insertion Sort, shell Sort, Heap Sort, Merge Sort, Quick Sort and Simple external Sorting algorithm.

7. DISJOINT SET:
Equivalence Relations, Find and Union algorithms an dynamic sets, Path compression and Union-by-Rank algorithm analysis.

8. GRAPH ALGORITHMS:
Representation of graph Topological Sort, shortest-path Algorithm, Network flow problem, Minimum spanning tree algorithm, Applications of Depth – First search, Introduction to NP-Completeness.

TEXT BOOK:

REFERENCE BOOKS:


4. **Query Evaluation**: Overview, Query processing, Query optimization, Performance Tuning.

5. **Database System Architectures**: Centralized and Client-Server Architecture, Server system Architecture, Parallel and Distributed database, Object based databases and XML. Advanced data types in databases. Cloud based data storage systems.


7. **Case Studies**: Postgre SQL, Oracle, IBM DB2 Universal Database, Microsoft SQL Server.

**Text Books:**

**References:**
1. Register Transfer and Micro operations:
Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

2. Basic Computer Organization and Design:
Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

3. Micro programmed Control:
Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

4. Central Processing Unit:
Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).

5. Input/output Organization:
Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

6. Memory Organization:
Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

7. Overview of Computer Architecture:

Text Book:

Reference Book:


6. **Distributed Systems & Synchronization**: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Data-Centric Consistency Models, Client-Centric Consistency Models, Consistency Protocols.


8. **Case Study**: Over View Of UNIX, LINUX, Windows NT , Android And IOS Operating systems
Text Books:


References:


7. **Network Devices**: Over View of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Brouters, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.


**Text Book:**


**References:**

2. Computer networks, Mayank Dave, CENGAGE.
Implementation of Data Structures and Algorithms using C.

1. To perform various operations such as insertion, deletion, display on single linked lists.

2. To implement
   (i) Stacks using linked list.  (ii) Queues using linked list.

3. To perform different types of searching techniques on a given list
   (i) Sequential search (ii) Transpose sequential search (iii) Binary search (iv) Fibonacci search

4. To perform different types of sortings on a given list
   (i) Bubble sort (ii) Insertion sort (iii) Selection sort (iv) Merge sort

5. To perform different types of sortings on a given list
   (i) Quick sort (ii) Shell sort (iii) Radix sort (iv) Topological sort

6. To perform the following
   (i) To convert the given infix expression to postfix expression
   (ii) To evaluate the given postfix expression.

7. To perform various operations on graphs
   (i) Vertex insertion.
   (ii) Vertex deletion.
   (iii) Edge insertion.
   (iv) Edge deletion.
   (v) BFS.
   (vi) DFS.

8. To implement dictionaries using hashing technique

9. To perform various operations on binary heap.

10. To perform various operations on Binary search tree.

11. To perform operations on AVL trees.

12. To perform various operations on B-tree.
1. **Accessing the Database**: The first laboratory exercise is to connect to a database, populate it with data, and run very simple SQL queries. (Data Definition, Table Creation, Constraints, Insert, Select Commands, Update & Delete Commands.)

2. **Basic SQL**: This lab covers simple SQL queries. (Inbuilt functions in RDBMS.)

3. **Intermediate SQL**: This lab covers more complex SQL queries. (Nested Queries & Join Queries, Control structures)

4. **Advanced SQL**: This lab covers even more complex SQL queries. (Procedures and Functions, PL/SQL, Cursors and Triggers)

5. **Database Access from a Programming Language**: This lab introduces you to database access from a programming language such as Java or C#. Although phrased using Java/JDBC, the exercise can be done using other languages, OBDC or ADO.NET APIs.

6. **Building Web Applications**: This lab introduces you to construction of Web applications. Although phrased using the Java Servlet API, the exercise can be done using other languages such as C# or PHP.

7. **Project**: Each student is assigned with a problem. The student is to develop a logical and physical database design for the problem and develop Forms, Menu design and Reports.
   
   A. The logical design performs the following tasks:
      
   1. Map the ER/EER diagrams to a relational schema. Be sure to underline all primary keys, include all necessary foreign keys and indicate referential integrity constraints.
      
   2. Identify the functional dependencies in each relation
      
   3. Normalize to the highest normal form possible
      
   B. Perform physical design based above logical design using Oracle/MSSQL on Windows platform and MySQL/PostgreSQL on Linux platform.

**Sample Term Projects**

1. Retailer database
2. Automobile sales database
3. Electronics vendor database
4. Package delivery database
5. Real estate database

**References**:

2) ORACLE PL/SQL by example, Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition
3) ORACLE Database Log PL/SQL Programming Scott Urman, TMG Hill.
4) SQL & PL/SQL for Oracle 10g, Black Book, Dr. P. S. Deshpande.
1. **Introduction to Robotics:**
   Classification, Components, Characteristics, Applications

2. **Robot Kinematics: Position Analysis-I**
   Robots as Mechanisms, Matrix Representation, Homogeneous Transformation Matrices, Representation of pure translation, Representation of pure rotation about an axis

3. **Robot Kinematics: Position Analysis-II**
   Representation of combined transformations, Transformations relative to the rotating, Inverse of Transformation Matrices, Forward and Inverse Kinematics of Robots

4. **Fundamentals of Actuating Systems:**
   Characteristics of Actuating Systems, Comparison of Actuating Systems, Hydraulic Devices, Pneumatic Devices, Magnetostrictive Actuating Systems

5. **Electric Actuators**
   Introduction to Electric Actuators, Electric Motors, Control of Electric Motors

6. **Sensors-I**

7. **Sensors-II**
   Touch and Tactile Sensors, Proximity and Range finders, Sniff Sensors, Vision Systems, Voice Recognizers, Voice Synthesizer, Remote Center Compliance Device

**Text Books:**


**Reference Books:**


2. Computational Intelligence, Davis Poole, Alan Mackwath, Randy Coehel, Oxford University Press 1998.
1. Introduction:
Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition an prediction, Folding problem, Sequence Analysis, Homology and Analogy.

2. Protein Information Resources
Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.

3. Genome Information Resources
DNA sequence databases, specialized genomic resources

4. DNA Sequence analysis
Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases.

5. Pair wise alignment techniques
Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dotplot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.

6. Multiple sequence alignment
Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching

7. Secondary database searching
Importance and need of secondary database searches, secondary database structure and building a sequence search protocol.

8. Analysis packages
Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

Text Books:
1. Introduction to Bioinformatics, by T K Attwood & D J Parry-Smith
   Addison Wesley Longman

Reference Books:
1. Introduction to Bioinformatics by M.Lesk OXFORD publishers (Indian Edition)
This lab is intended to get familiarized with mechanical, electrical, and electronics structures of different types of robots for monitoring, controlling, and developing applications like pick and place, swapping, etc., by either stand-alone controller in the robot structure or interfacing to PC.

1. Programming a simple Robot on Wheels.
3. Experiments based on Bipedal Robot.
4. Experiments based on Humanoid Robot-ROOBONOVA.
5. Pick and Place Application Programming with 4 DOF Robot Arm by Interfacing to PC.
6. Swap Application Programming with 4 DOF Robot Arm by Interfacing to PC.
7. Pick and Place Application Programming with 5 DOF Robot Arm by Interfacing to PC.
8. Swap Application Programming with 5 DOF Robot Arm by Interfacing to PC.
9. Pick and Place Application Programming with 6 DOF Robot Arm by Interfacing to PC.
10. Swap Application Programming with 6 DOF Robot Arm by Interfacing to PC.

REQUIRED MATERIALS

Mechanical Tools with Tool Box, IBM Compatible PCs- 10 No,..
Interface Cables for Robot Structures.
Robot Platform.
Walking Robot structure with Controller.
BRAT Kit for Bipedal Robot.
Simple Humanoid Robot-ROBONOVA-I.
5 DOF Robot Arm with Accessories.
6 DOF Robot Arm with Accessories.
Purpose: This lab is expected to learn about various Bio-Informatics tools to implement various theoretical concepts related theory papers. They are expected to know about the different databases available and techniques like sequence alignment problems.

List of Experiments:

1. Introduction about different biological databases
   Protein and Gene Sequence Databases (NCBI,DDBJ, EMBL, SWISS PROT,PIR)
   Structure Databases (MMDB,PDB,FSSP,CATH,SCOP)
   Pathway Databases (KEGG,BRENDA,METACYC,ECOCYC)
   Bolographic Databases (PUBMED,MEDLINE)

2. Sequence Retrieval From Biological Databases

3. Gene Prediction Methods

4. Analysis Of Protein Sequence Using Expasy

5. Sequence Similarity Searching Of Nucleotide Sequences

6. Sequence Similarity Searching Of Protein Sequences

7. Multiple Sequence Alignment

8. Dynamic Programming Method-Local Alignment


Reference Book

Lab Manual
MTCST CN 1.8          Computer Networks Lab

Instruction: 3 Periods/week          External Assessment: 100 marks

Internal Assessment: 50 Marks       Time: 3 Hours

a) Network Programming

1. Socket Programming
   a. TCP Sockets
   b. UDP Sockets
   c. Applications using Sockets

2. Simulation of Sliding Window Protocol

3. Simulation of Routing Protocols

4. RPC

5. Development of applications such as DNS/ HTTP/ E – mail/ Multi - user Chat

b) Web Programming

1. Design of the Web pages using various features of HTML and DHTML

2. Client server programming using servlets, ASP and JSP on the server side and java script on the client side

3. Web enabling of databases

4. Multimedia effects on web pages design using Flash.

Reference Books:

1. Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill