REGULAR & MODULAR
M.E. IN ELECTRONICS & COMMUNICATION ENGINEERING
(INDUSTRY-ORIENTED & PRACTICE BASED)
EXAMINATION  2010-2011 AND 2011-12
# SEMESTER-WISE COURSE CODES & TITLES

## EXAMINATION 20--

### 1st Semester:

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Hours/Week</th>
<th>Total</th>
<th>Theory/Viva</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 6101</td>
<td>Advanced Digital Signal Processing</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>ECE 6102</td>
<td>Optical Fiber Communication</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>ECE 6103</td>
<td>Advanced Digital Communication</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>ECE 6104</td>
<td>Advanced Mathematics</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>ECE 6105</td>
<td>Digital System Design</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
</tr>
</tbody>
</table>

--------------------------------------------------------------------------------------

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Hours/Week</th>
<th>Total</th>
<th>Theory/Viva</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td>20</td>
<td>12</td>
<td>32</td>
<td>500</td>
</tr>
</tbody>
</table>

--------------------------------------------------------------------------------------

### 2nd Semester:

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Hours/Week</th>
<th>Total</th>
<th>Theory/Viva</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 6201</td>
<td>Embedded System Design</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>ECE 6202</td>
<td>Image Processing</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>ECE 6203</td>
<td>Wireless &amp; Mobile Communication</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Elective-I</td>
<td></td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Elective II</td>
<td></td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
</tr>
</tbody>
</table>

--------------------------------------------------------------------------------------

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Hours/Week</th>
<th>Total</th>
<th>Theory/Viva</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td>20</td>
<td>12</td>
<td>32</td>
<td>500</td>
</tr>
</tbody>
</table>

--------------------------------------------------------------------------------------

---
Elective-I

(ECE-6204) Advanced Computer Networks
(ECE-6205) Network Programming
(ECE-6206) Information Theory & Coding
(ECE-6207) PLCs & SCADA

Elective-II

(ECE-6208) Advanced Antenna Systems
(ECE-6209) Cryptography & Network Security
(ECE-6210) Bio Informatics
(ECE-6211) VLSI Design

3rd Semester

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Hours/Week</th>
<th>Total</th>
<th>Theory/Viva</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elective Subjects*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective-III</td>
<td></td>
<td>4</td>
<td>4</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>Elective-IV</td>
<td></td>
<td>4</td>
<td>4</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>ECE 7105</td>
<td>Thesis-Work I</td>
<td>0</td>
<td>20</td>
<td>20</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>08</td>
<td>20</td>
<td>28</td>
<td>200</td>
<td>400</td>
</tr>
</tbody>
</table>

Elective-III

(ECE-7101) Neural Network & Fuzzy Logic
(ECE-7102) RF & Microwaves
(ECE-7103) Simulation & Modeling

Elective-IV

(ECE-7104) Nano Electronics
(TQM-7105) Total Quality management
(MTE-6201) HRD & Training Methods
(MTE-6202) Research Methodology
(MTE-6207) Entrepreneurship Development
(MTE-7103) Technology Management
**4th Semester:**

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Hours/Week</th>
<th>Theory/ Viva</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE7201</td>
<td>Thesis Work-II</td>
<td>- - 28</td>
<td>28 ---</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: No numerical marks are to be assigned to thesis work. It is either “Accepted” or “Rejected”. Quality of work reported in the thesis can be graded in terms of “Very Good”, “Good” or “Average”.
SCHEME OF EVALUATION
FOR M.Tech. /M.E. REGULAR & MODULAR PROGRAMMES

1. DURATION OF PROGRAMMES

i) For Regular M.Tech./M.E. Programmes

The normal duration of M.Tech./ME programme including thesis will be 2
academic year (4 semesters). The maximum period of completion of the
programme including thesis will be 4 academic years (8 semesters). 2 year (4
semesters) extension in genuine hardship cases is allowed by the Vice-Chancellor
of Panjab University, Chandigarh for submission of thesis.

ii) For Modular M.Tech./M.E. Programmes

The normal duration of Modular M.Tech./M.E. Programmes including thesis will
be 4 academic years, (8 spells, each spell of 5 weeks duration including Saturdays/
& Sunday). The maximum period of completion of the programme including
thesis shall be 8 academic years (16 spells). 2 years (4 spells) extension in
genuine hardship cases is allowed by the Vice-Chancellor of Panjab University,
Chandigarh for submission of thesis.

2. NUMBER OF THEORY PAPER ALLOWED IN A SEMESTER/SPELL

(i) For M.Tech./M.E. Regular Programmes

All students will be required to qualify twelve theory papers during the course. No
students will be allowed to qualify more than 5 papers at the end of first semester
and not more than 10 papers (including the papers passed in the first semester), at
the end of second semester or first year. Two papers will be offered in the 3rd
semester.

(ii) For M.Tech/M.E. Modular Programmes

All students will be required to qualify 12 theory papers during the course. No
student will be allowed to qualify more than two papers at the beginning of the 2nd
spell and not more than four papers (including the papers passed in the beginning
of 2nd spell) at the beginning of 3rd spell and so on.

3. CONDITIONS FOR APPEARING IN END-SEMESTER EXAMINATION

i) Periodic Tests (for M.Tech./ME Regular Programmes)

Every student has to appear in two periodic tests as decided by the Institute and
must qualify the same. There will be only one make-up test for those students
who are unable to appear in one or both mid-semester tests due to genuine reasons
to the satisfaction of Coordinator.
Students, whose performance in the class-tests/sessionals is not satisfactory, are liable to be detained by the Director from appearing at the University Examinations. The detailed rules of the University Examinations are available at Panjab University, Chandigarh and all students are advised to get the latest copy for guidance and further information.

ii) PERIODIC TEST (FOR M.TECH./ME MODULAR PROGRAMMES)

Every student has to appear in one periodic test as decided by the Institute and must qualify the same. There will be only one make-up test for those students who are unable to appear in the test due to genuine reasons to the satisfaction of Coordinator.

Students, whose performance in the tests/sessionals is not satisfactory, are liable to be detained by the Director from appearing at the University Examinations. The detailed rules of the University Examinations are available at Panjab University, Chandigarh and all students are advised to get the latest copy for guidance and further information.

4. EXAMINATION AND RESULT (FOR M.TECH./ME PROGRAMMES BOTH REGULAR AND MODULAR)

- Minimum marks to pass examination: 50% in the sessional in the each subject and 40% in each theory paper. Both the theory and sessional marks will be considered independent of each other.
- Aggregate pass percentage will be 50%.

- Weight age in each subject
  - 50 marks : Sessional
  - 100 marks: Final theory examination

- The students who obtain in first attempt 75% or more of the aggregate marks in both theory and sessionals and also if the thesis has been adjudged to merit distinction are awarded First Division with Distinction. If the thesis has not been adjudged to merit distinction then the students are awarded first division.

- The students who obtain 60% or less than 75% of the aggregate marks in all the theory papers and the sessionals are awarded First Division

- The students who obtain less than 60% of the aggregate marks in all the theory papers and the sessionals but not less than 40% in each theory paper and 50% in the sessionals will be awarded Second Division.
Preliminary Thesis/Thesis

Four neatly typed or printed copies of thesis properly bound, shall be submitted to the University through Guide and ME Cell of the institute.

5. COURSES OF STUDY AND EVALUATION SCHEME

a) M.Tech/ME Regular Programme

In each of these regular programme, there are a total of 12 theory subjects, each of 150 marks (including sessional of 50 marks), a thesis work-I and thesis work-II, a total of 2000 marks. No numerical marks are to be assigned to thesis work. It is either “Accepted” or “Rejected”. Quality of work reported in the thesis can be graded in terms of “Very Good”, “Good” or “Average”. A candidate will study 05 theory subjects each in First & Second semesters; two theory subjects & thesis based project work in third semester and thesis work in fourth semester. The courses of study and evaluation scheme in respect of each of M.Tech/ME Regular programme are given here. A semester will consist of 18 weeks and in each week there will be an approximately 29 contact hours for teaching.

M.TECH./M.E REGULAR PROGRAMMES

<table>
<thead>
<tr>
<th>Semester-I</th>
<th>Code No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE6101</td>
<td>Subject-1</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>ECE6102</td>
<td>Subject-2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>ECE6103</td>
<td>Subject-3</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>ECE6104</td>
<td>Subject-4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>ECE6105</td>
<td>Subject-5</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>20</td>
<td>0</td>
<td>09</td>
<td>29</td>
<td>500</td>
<td>250</td>
<td>750</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester-II</th>
<th>Code No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE6201</td>
<td>Subject-1</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>ECE6202</td>
<td>Subject-2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>ECE6203</td>
<td>Subject-3</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Elective-I</td>
<td>Subject-4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Elective-II</td>
<td>Subject-5</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>7</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>20</td>
<td>0</td>
<td>09</td>
<td>32</td>
<td>500</td>
<td>250</td>
<td>750</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester-III</th>
<th>Code No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elective III</td>
<td>Subject-1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Elective IV</td>
<td>Subject-2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Thesis Work-I</td>
<td></td>
<td>-</td>
<td>-</td>
<td>20</td>
<td>20</td>
<td>-</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>8</td>
<td>0</td>
<td>20</td>
<td>28</td>
<td>200</td>
<td>200</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>
b) M.Tech/ME Modular Programme
In each of this Modular programme, there are a total of 12 theory subjects, each of 150 marks (including sessional of 50 marks) a thesis work-I and thesis work-II a total of 1800 marks. No numerical marks are to be assigned to thesis work. It is either “Accepted” or “Rejected”. Quality of work reported in the thesis can be graded in terms of “Very Good”, “Good” or “Average”. A candidate will study 02 theory subjects each in 1st to 6th spells; thesis work-I in 7th spell, and thesis work-II in 8th spell. The courses of study and evaluation scheme for M.Tech./ME Modular programme are the same as described for M.Tech./ME Regular programme and is detailed here.

<table>
<thead>
<tr>
<th>Spell-1</th>
<th>Code No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ECE6101</td>
<td>Subject-1</td>
<td>15</td>
<td>0</td>
<td>11</td>
<td>26</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>ECE6102</td>
<td>Subject-2</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>30</td>
<td>0</td>
<td>11</td>
<td>41</td>
<td>200</td>
<td>100</td>
<td>300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spell-2</th>
<th>Code No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ECE6103</td>
<td>Subject-1</td>
<td>15</td>
<td>0</td>
<td>11</td>
<td>26</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>ECE6104</td>
<td>Subject-2</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>30</td>
<td>0</td>
<td>11</td>
<td>41</td>
<td>200</td>
<td>100</td>
<td>300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spell-3</th>
<th>Code No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ECE6105</td>
<td>Subject-1</td>
<td>15</td>
<td>0</td>
<td>11</td>
<td>26</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>ECE6201</td>
<td>Subject-2</td>
<td>15</td>
<td>0</td>
<td>11</td>
<td>26</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>30</td>
<td>0</td>
<td>22</td>
<td>52</td>
<td>200</td>
<td>100</td>
<td>300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spell-4</th>
<th>Code No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ECE6202</td>
<td>Subject-1</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>ECE6203</td>
<td>Subject-2</td>
<td>15</td>
<td>0</td>
<td>11</td>
<td>26</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>30</td>
<td>0</td>
<td>11</td>
<td>41</td>
<td>200</td>
<td>100</td>
<td>300</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spell-5</th>
<th>Code No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elective-I</td>
<td>Elective-I</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>Elective-II</td>
<td>Elective-II</td>
<td>15</td>
<td>0</td>
<td>11</td>
<td>26</td>
<td>100</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>Spell-6</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>------------------</td>
<td>------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code No.</td>
<td>Subject</td>
<td>L</td>
<td>T</td>
<td>P</td>
<td>Total</td>
<td>Theory</td>
<td>Sessional</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>---------------</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>-------</td>
<td>--------</td>
<td>-----------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Elective III</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective IV</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>100</td>
<td>50</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
<td><strong>30</strong></td>
<td><strong>200</strong></td>
<td><strong>100</strong></td>
<td><strong>300</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| Spell-7 |
|------------------|--------|--------|--------|------------------|------------------|------------------|</p>
<table>
<thead>
<tr>
<th>Code No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thesis Work-I</td>
<td>72</td>
<td>72</td>
<td>-</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>72</strong></td>
<td><strong>72</strong></td>
<td><strong>-</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

<p>| Spell-8 |
|------------------|--------|--------|--------|------------------|------------------|------------------|</p>
<table>
<thead>
<tr>
<th>Code No.</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thesis Work-II</td>
<td>101</td>
<td>101</td>
<td>-</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>101</strong></td>
<td><strong>101</strong></td>
<td><strong>-</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>
FIRST SEMESTER

ECE-6101  ADVANCED DIGITAL SIGNAL PROCESSING

L  T  P
4  0  3

PART A

Transformations:
Review of Z-Transform, Solution of Linear Difference Equations, Fourier series and Fourier Transform, Discrete Fourier Transform, Radix-2 FFT.
Introduction to Radix-4 and Split Radix FFT, Discrete Cosine Transform, DCT as Orthogonal Transform, Walsh Transform, Hadamard Transform, Wavelet Transform.

Digital Filters:

Multirate Digital Signal Processing:
Sampling Rate Alteration Devices, Multirate Structures for sampling rate conversion, Multistage design of Decimator and Interpolator, The Polyphase Decomposition, Arbitrary Rate Sampling Rate Converter, Filter Banks, QMF banks, Multilevel Filter Banks, Sub-band Coding, Discrete Wavelet Transform.

PART B

Linear Prediction and Optimum Linear Filters:
Forward and Backward Linear Prediction, Properties of Linear Prediction-Error Filters, AR Lattice and ARMA Lattice-Ladder Filters, Wiener Filters for Filtering and Prediction.

Adaptive Digital Filters:

Power Spectrum Estimation:
DSP Chips:
Introduction to fixed point and floating point processors, ADSP21xx and TMS320Cxx-Architecture, Memory, Addressing Modes, Interrupts, Applications. Comparison of ADSP21xx and TMS320Cxx series. (6)

Practice Task:
(Implement the following programs in MATLAB)
2. Circular Convolution.
3. DFT and FFT of Discrete time sequences.
4. Design of FIR Filters.
5. Design of IIR Filters.
8. Decimation and Interpolation of Discrete time sequences.
9. Implementation of an Arbitrary rate Sampling Rate Converter.
10. Illustrate Adaptive Filtering using LMS Algorithm.

Recommended Books:

Review of Optical Fiber Communication:
Need of optical transmission, Fiber optic communication system, Advantage of OFC, Basic optical laws and transmission parameters, Geometrical optics description: Step Index Fiber & Graded Index Fiber, Mode Theory for optical propagation, Modes in planar wave, Phase & Group Velocity. (05)

Signal Degradation in OFS:
Attenuation, Material Absorption, Scattering Loss, Bending Loss, Information Capacity Determination, Group Delay, Material Dispersion, Waveguide Dispersion, Higher order Dispersion, Polarization Mode Dispersion. (06)

Optical Transmitter:
Basic Concept: Emission and absorption Rates, p-n junctions, Non-radiative recombination, semiconductor materials, LED: Power current relationship, LED spectrum, LASER Diodes, ILD & its characteristics, Optical Gain, Feedback and Laser threshold. (06)

Optical Receivers:
Optical detection principles & devices, Detection response time, p-i-n photo-diode, Avalanche photodiode, Receiver operation: Digital Transmission, Error sources, Receiver configuration, Digital receiver performance, Probability of error, the quantum limit. (07)

Digital and Analog Transmission System:
Point to point links: System consideration, Link power budget, Rise time budget, First generation distance, Transmission distance for single mode fiber. Line coding: NRZ codes, RZ codes, error correction, noise effects on system performance, Overview of Analog links, carrier to noise ratio. (07)

Optical Amplifier:
Basic application and types of optical amplifiers, Semiconductor optical amplifiers, Erbium doped fiber amplifiers: architecture and types, Amplifier-noise, Raman Amplifier, wavelength converters. (07)

Optical Networks:
Basic Networks, SONET/SDH networks, Operational principle of WDM networks, Non linear effects on network performance, Performance of WDM+EDFA system, Solitons, Optical CDMA & TDMA, Optical Switches/Cross Connect, Add/Drop Mux. (07)
Practice Task:
Practical tasks related to theory.

Recommended Books:

4. Optical Networks, Black, Pearson education.

ECE-6103 ADVANCED DIGITAL COMMUNICATION

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

PART A
Elements of a Digital communication system, communication channels and their characteristics, mathematical models for communication channels, recent trends in digital communication, Deterministic and Random Signal Analysis, Band pass and Low pass Signal Representation, Signal space representation of waveforms.

Digital modulation Schemes
Representations of digitally modulated signals, memory less modulation methods, PAM,PM,QAM, multidimensional signaling, Signaling scheme with memory, CPFSK,CPM, Power spectrum of Digitally modulated signals, PSD of a digitally modulated signals with memory, PSD of linearly modulated signals.

Optimum Receivers for Additive White Gaussian Noise Channels
Waveforms and vector channel models, waveforms and Vector AWGN channels, Optimum detection for the Vector AWGN channel, Implementation of the optimal receiver for AWGN channels, the correlation receiver, matched filter receiver, frequency domain interpretation of the matched filter. Performance analysis for wire line and radio communication system.

PART B
Carrier and symbol synchronization
Signal parameter estimation, the likelihood function, carrier recovery and symbol synchronization in signal demodulation, carrier phase estimation, maximum likelihood carrier phase estimation, phase locked loop, effect of noise on the phase estimation, symbol timing estimation, maximum likelihood timing estimation, non –decision directed timing estimation.

Multichannel and Multicarrier System
Multichannel Digital Communication in AWGN channels, binary signals, M-ary orthogonal signals,Multicarrier communication, single-carrier versus multicarrier
modulation, Capacity of a Nonideal linear filter channel, orthogonal frequency division multiplexing (OFDM), modulation and demodulation in an OFDM system, Spectral characteristics of multicarrier signals, Bit and Power allocation in multicarrier modulation.

**Spread Spectrum Signals for Digital Communication**
Model of spread spectrum digital communication system, direct sequence spread spectrum signals, frequency hopped spread spectrum signals, CDMA system based on FHSS signals, Synchronization of spread spectrum systems.

**Practical Task:**
1. Digital Modulation techniques using MATLAB
2. Study of Spread spectrum signals
3. Simulation of digital communication system

**Books:**

**ECE 6104 ADVANCED MATHEMATICS**

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>PART A</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Series solution of differential equations, Power series methods, Legendre’s polynomial, Generating functions, Recurrence relations. (08)

Frobenius method, Series solution of Bessel’s differential equation, Modified Bessel’s functions, Generating functions, Recurrence relations. (08)

Equations reducible to Bessel’s equation. (04)

Sturm Liouville’s problem, orthogonal functions, Orthogonality of eigen functions, Eigen function expansions. (06)

**PART B**

Conformal mapping, Exponential function, Trigonometric functions, Hyperbolic functions, Inverse trigonometric functions, Logarithmic function, Power function, Bilinear and Schwarz-Christoffel transformation, Applications to engineering problems. (8)
Matrices, Functions of square matrices, Quadratic and Hermitian forms, Solution of linear simultaneous equations by Gaussian elimination and its modifications, Crout’s triangularization method, Iterative method’s-Jacobi’s method, Gauss-Seidel method, Eigenvalue by iteration. (10)

System simulation, Technique of simulation, Monte Carlo method, Comparison and simulation with analytical method, Numerical computation techniques. (8)

Recommended Books:

3. Narsingh Deo, System Simulation with Digital Computer, Prentice Hall of India
5. Geoffrey Gordon System Simulation, Prentice Hall of India

ECE-6105 DIGITAL SYSTEM DESIGN

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

PART A

Introduction to Digital Design Concepts:
Design Constraints and Logic Representation of System. (02)

Analog interfacing:
A/D conversion concepts, Analog & Digital Conversion related errors. (03)

Combinational Logic Design and Implementation:
Multiplexer/Decoder, PLA/Pal/GAL, ROM, CPLD and FPGA level customized design, ALU, VHDL models and simulations of combinational circuits. (18)

PART B

Sequential Logic Design and Implementation:
Practical Synchronous and asynchronous circuit design. Design and Implementation of sequential digital system, state representation, analysis of digital systems, synchronization, design criteria, design procedure. High level modeling of digital systems, controller realization, Timing & Frequency consideration, system examples. VHDL models and simulation of sequential circuits (18)
Design for Testability:
Fault and Fault coverage in digital circuits, internal scan test methodology, BIST and Boundary scan (JTAG) techniques.

Practice Task:
Practical tasks related to theory.

Recommended Books:

1. Combinational design & testing using PLA/PAL/ROM chips.
2. Combinational design, simulation, synthesis & implementation.
3. An Engineering Approach to Digital Design –W.J.Fletcher
4. Digital Design –M. Morris Mano
5. Digital Design principles and practices by J.F.Wakerly
6. Digital Systems-Principles and applications-Ronald Tocci.
SECOND SEMESTER

ECE-6201  EMBEDDED SYSTEM DESIGN  L  T  P  4  0  3

Part A

Introduction to Embedded System:
Their classification & characteristics, Concepts and Processes of system level design of embedded system. (04)

Microcontrollers:
Introduction to microcontrollers, Memory, Buses, Direct Memory Access, Interrupts, Microprocessor Architecture, Interrupt Basic, Shared Data Problems, Interrupt Latency, PIC 16F8XX Flash Microcontrollers, CPU architecture, Register file structure, Instruction Set, Programs, Timers and Interrupts, Interrupt Service Routine, Features of Interrupts, Interrupt vector & Priority, Timing Generation & Measurements, Interfacing Methods, I/O Interface, LCD interfacing, Seven segment interfacing, I2C Bus, DAC, ADC, UART. (11)

Program Modeling Concepts in Single and multiprocessor system Software-Development Process:
Modeling Processes for software Analysis before software implementation, Program model for event controlled, Modeling of Multiprocessor Systems. (08)

Part B

Embedded Core Based Design:
System -on -Chip, Application specific Integrated circuit, Overview of Embedded Processors like ARM, MIPS and Intel MMX series, Architecture, Organization and instruction set, Memory management, High level logic synthesis. Data parallel issues e.g SIMD, MIMD, MISD, SISD. Introduction to FPGA, Basics of FPGA (15)

Real Time programming and Operating System (RTOS)
RTOS Overview, Basics of RT- Linux as a RTOS, Assembly language, C++ (07)

Practice Task:
1. PIC Programming
2. FPGA Programming
3. PIC Microcontroller based projects

Recommended Books:
1. Microcontrollers (Theory and Applications)- Ajay V. Deshmukh
2. An Embedded System Primer, by David E. Simon
3. Embedded system Design by Steve Heath
4. PIC Microcontroller by John B. Peatman
5. ARM system architecture by Steve Furber(Addison Wesley)
6. Programming Embedded System in C/C++ by M.Barr
PART A

Introduction:
Fundamental concept of digital image processing, component of image processing system, image acquisition. (04)

Basic Image Fundamentals:
Pixels, sampling, quantization, resolution, representation as a matrix, operation, camera angles and perspective transformation. (05)

Image Enhancement:
Concept of Spatial Domain and Frequency domain enhancement, Basic Gray Level Transformation, Histogram Processing, Enhancement using Arithmetic/logic Operations, Subtraction, Averaging, Basics of Spatial Filtering. (08)

Image Restoration
Model of the image Degradation/Restoration Process, Noise Models, Restoration in the presence of Noise, point spread function Different point spread functions, Blurring, De-blurring Algorithm. (07)

PART B

Color Image Processing:
Color Fundamentals, Color Models, Basics of Full-Color image processing, Color Transformations. (06)

Image Compression:
Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression. (06)

Image Segmentation & Representation:
Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors, Regional Descriptors (09)
Practice Task:
(Based on MATLAB)
1. Intensity transformation
2. Histogram Processing.
3. Spatial Filtering.
5. Image Restoration.
6. Image Denoising
7. Color Image Processing
8. Wavelet Transform
9. Image Compression
10. Morphological Image Processing
11. Point, Line and Edge Detection
12. Image Segmentation
13. Image Representation and Description
14. Object Recognition

Recommended Books:
1. Digital Image processing by R.C. Gonzalez and R.F.Woods (Pearson Education)
5. Digital Image Processing by W.K.Pratt
6. Digital Image Processing using MATLAB by Woods & Gonzalez (Pearson Education)

ECE-6203 WIRELESS & MOBILE COMMUNICATION

L T P
4 0 3

PART A

Mobile Communication:
Types of Mobile Communication Systems, Mobile radio systems around the world, Trends in cellular radio and personal communications. (03)

Cellular Design Fundamentals:
Frequency reuse, Channel alignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems, mechanism for capacity improvement-cell splitting, cell sectoring, and micro cell zone concept. (05)

Multiple access schemes : TDMA, FDMA, CDMA, WCDMA, OFDMA, Random Multiple access Scheme, Packet Radio Protocols, CSMA, Reservation Protocols, Capacity of Cellular systems. (09)

GSM Architecture& Protocols. GSM Burst structure, Carrier and Burst Synchronization, Design Consideration. Security Aspects, Power Control strategies. (06)
PART B

CDMA Digital Cellular Standards, Services and Security Aspects, Network Reference Model and Key Features, Advantages over TDMA, CDMA WLL System. Recent developments. (05)


Introduction to 3G Wireless Networks: WiFi, WiMax, Bluetooth (06)

Practice Task:-

1. Simulation and implementation of baseband digital signals
   (i) Types of baseband signals: unipolar, polar, bipolar, RZ, NRZ, etc.
   (ii) Distortion and noise. Eye diagram.

2. Simulation and implementation of modulated digital signals
   (i) PSK, ASK and FSK modulations.
   (ii) Demodulation with envelope detection and synchronous.
   (iii) PSK differential modulation.
   (iv) Quadrature modulations (QASK and QPSK).
   (v) QAM modulation.

3. Global System for Mobiles (GSM)
   (i) Cellular telephony. GSM Architecture.
   (iii) AT Commands
   (iv) Working of GSM mobile station.

4. Multiple Access
   (i) Time division multiple Access
   (ii) Frequency division multiple access

5. Spread Spectrum communication systems
   (i) Pseudo-noise coders
   (ii) Direct sequence spread spectrum communication systems
   (iii) Frequency hopped spread spectrum communication systems
   (iv) CDMA wireless computer communication systems
6. Channel Characteristics
   (i) Multipath channel propagation characteristics
   (ii) Bit-error rate measurement

7. Wireless Networks
   (i) Bluetooth wireless network.
   (ii) Wi-Fi
   (iii) Wi-Max

8. Educational field visit to a Mobile Switching Center (MSC)

Recommended Books:
1. Mobile and personal Communication Systems and services by Raj Pandya (PHI)
2. Wireless Communication by Rappart (PHI)
3. Mobile Communication by Lee (TMH)
4. Wireless & Mobile System by Dharam Prakash Aggarwal, Qing-Anzeng, (Thomson)

ECE-6204 ADVANCED COMPUTER NETWORKS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

PART A

Overview:

Data Link Layer:

Local/ Personal Area Networks:
IEEE LAN standards: Ethernet (802.3), Gigabit Ethernet, Wireless LAN (802.11), Bluetooth, and Broadband Wireless (802.16). (05)

Wide Area Networks: X-25, Frame Relay, ATM. (04)

Network Layer:
Congestion control: Principles and policies congestion control in Virtual-circuit and Datagram subnets. Load shedding and Jitter control.
Quality of Service: Techniques for achieving good Quality of Service. Integrated Services. Differentiated Services. Label Switching and MPLS.

PART B

Internetworking and Internet Protocols:
Tunneling, Fragmentation. The IPv4 Protocol, IPv4 addresses, IPv6 Protocol, Mobile IP, OSPF, BGP, ARP, DHCP, Internet Control Protocols, Classless Inter-domain Routing (CIDR), Network Address Translation (NAT), Subnetting and Supernetting.

Transport Layer:
Transport layer protocol issues: Addressing, Connection Establishment, Connection Release, Flow control and Multiplexing. Internet Transport Protocols: TCP and UDP.

Network Applications:
DNS, Electronic Mail, TELNET, FTP, SNMP, World-wide Web, Multi-media.

Network Security:
Introduction to Network Security, Cryptography, Symmetric-key and Asymmetric Key Algorithms. Digital Signatures.

Recommended Books:
8. SHELTON, TOM Encyclopedia of Networking, TMH
PART B

TCP/IP PROGRAMMING:

Interprocess Communication:
Remote procedure Call, Window Sockets, Named pipe, Mailslots, NetBIOS, and IPX/SPX. (08)

PART B

Windows programming:


Web Programming:
HTML, XML, Scripting. (05)

Practice Task: (To be covered under theory class)

1. Develop an SMTP client and a server.
2. Develop a POP client and a server.
3. Develop a proxy server.
Recommended Books:

1. SINHA, ALOK K. Network Programming in Windows NT, Addison-Wesley
2. STEVENS, R.W. TCP/IP Illustrated, Vol.1: The Protocols, Addison-Wesley
3. STEVENS, R.W. TCP/IP Illustrated, Vol.2
4. STEVENS, R.W. TCP/IP Illustrated, Vol.3
5. HTML in 24 Hours, SAMS.

ECE-6206 INFORMATION THEORY & CODING

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

PART A

The Communication process and the nature of information. (02)

Information Sources, measurement of information and the Entropy Function:
Entropies defined, and why they are measures of information, marginal entropy, joint entropy, Conditional entropy and the Chain Rule for Entropy. (06)

Sources with and without Memory:
Sources coding theorem, Prefix, Variable and Fixed- length Codes. Error Correcting Codes. (06)

Channel Types, Properties, Noise and Channel Capacity:
Perfect communication through a noisy channel. The binary symmetric channel, their classification and capacity of a noiseless discrete channel. The Hartley and Shannon laws for channel capacity. (08)

PART B

Continuous Information; Density; Noisy Channel Coding Theorem:
Extensions of the discrete entropies and measures to the continuous case. Signal-to-noise ratio; power spectral density, Gaussian channels, Relative significance of bandwidth and noise limitations. The Shannon rate limit and efficiency for noisy continuous channels (06)

Error Control Coding:
Linear blocks codes and their properties, hard-decision decoding, cyclic codes, Convolution codes, Soft-decision decoding, Viterbi decoding algorithm. (08)

Advanced Coding Techniques and Cryptography:
BCH codes, Trellis coded modulation, introduction to cryptography, overview of encryption techniques, symmetric cryptography, DES, IDEA, asymmetric algorithms, RSA algorithm. (09)
Recommended Books:
2. Richard B. Wells, Applied Coding and Information Theory for Engineers, Pearson
4. R.G. Gallager, Information Theory and Reliable Communication, Wiley
8. Thomas Cover & Joy Thomas, Elements of Information Theory, John Wiley & Sons

ECE-6207 PLCs AND SCADA

L T P

4 0 0

PART A

Introduction:
Fundamental Control Concepts, PLC System, CPU-Architecture, Programmers and Monitors, PLC
Input and Output Modules-Analog and Digital, power Supply of PLCs, Internal Timers, Counters, and Flags. Criteria for Selection of PLC, PLC vs. PC. Memory requirements. (07)

SCADA:
Architecture, Potential benefits of SCADA.
Introduction to SCDA software (RS VIEW-32)Project Creation, Alarming, Data Logging, Trending, Object keys, Derived Tags Event Generation, Macros, Object Linking & Embedding, Security, PLC based SCADA Systems. (15)

PART B

Programming Procedures:
Different programming formats like ladder diagram, statement list, Boolean etc.
Programming based on ladder diagrams using relay, timers counters sequencers, data transfer, comparison, arithmetic, logical instructions & software flags, Programming equipments like computer, hand-held programmer, on-board programming, Human machine interface, Program Scanning, Proximity Sensors and their connection to PLC, PLC as PID Controller. (19)

NETWORKING:
Networking of PLCs, Types of Networking, and Cell control by PLCs. (04)
Recommended Books:

1. Introduction to Programmable Logic Controllers by Gray Dunmig, Boston, Delmar
2. Manuals on PLCs by Siemens/Allen Bradley
3. Programming Logic Controllers by Hackworth and Hackworth Jt.

ECE-6208  ADVANCED ANTENNA SYSTEMS

PART A

Review of vector potentials & antenna parameters. Linear antennas viz. $\lambda/2$ & $\lambda/4$(Input impedance, far fields, radiation resistance, directivity and efficiency). Antenna array (different types, discussion on binomial & Dolph- Tschebysheff array), Super directivity (Efficiency & directivity), design considerations. (05)

Antenna Synthesis and continuous sources (Line-source, Discretization of continuous sources), Schelkunoff polynomial method, Fourier transform method, Taylor Line-source, Triangular, cosine and cosine-squared amplitude distributions, continuous aperture. (05)

Broad-band antennas (Bi-conical, Sleeve Dipole, Cylindrical dipole, rhombic antenna, helical antenna, Yagi-Uda array), Frequency Independent antenna (planar and conical spiral, log periodic). (05)

Different antenna: (Field equivalence principle) Radiation equations, Directivity, Rectangular and Circular aperture (Radiation from apertures and distribution), Horn antenna (E-plane, H-plane, Corrugated, Di-electric loaded-field & directivity calculation). (07)

PART B

Micro-strip antenna, Basic characteristics, Rectangular and Circular patches, Transmission line and cavity model, Feeding techniques and recent advancement. (05)

Antenna fabrication techniques (Linear, Horn & Microstrip patch), Measurements (Impedance, Gain, polarization and Radiation pattern). Matching techniques. Antenna ranges. (05)

Smart Antenna (Principle, Block diagram), Design considerations and recent development. (03)
**Review of radar** range equation (using all parameters), Radar Signal Integration, Range Accuracy and Resolution, Signal detection and estimation, Clutter and noise suppression. (08)

**Simulation Software** based discussion of antenna and radar (Design and Calculation). (02)

**Recommended Books:**

1. C.A Balanis, Antenna Theory-Analysis, John Wiley
2. J.D.Karus- Antenna, McGraw Hill
5. B.Edde- Radar, Principles, Technology, Application-prentice Hall

**ECE-6209 CRYPTOGRAPHY & NETWORK SECURITY**

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**PART - A**

**Introduction:**


**Symmetric Key Cryptography:**

Substitution and Transposition techniques. Block cipher principles. Data Encryption Standard (DES), Triple DES. Block cipher modes of operation. Stream cipher structure and RC4 algorithm. Confidentiality using symmetric key encryption. Symmetric key distribution. (08)

**Asymmetric Key Cryptography:**


**Message Authentication:**

Authentication requirements and functions. Message Authentication Code. Hash functions. Hash and MAC algorithms: MD5, Secure Hash Algorithm (SHA) and HMAC. (04)
Digital Signatures and Authentication:

PART - B

Email Security:
Pretty Good Privacy (PGP) operation. S/MIME specifications and functionality. (04)

IP Security:
Architecture, Authentication Header, Encapsulating Payload, Security Associations, Key Management. (04)

Web Security:

Intrusion Defence Mechanisms:
Intrusion Detection techniques. (03)

Malicious Software:
Viruses and related threats. Virus countermeasures. Distributed Denial of Service Attacks. (03)

Firewalls:
Design Principles, Characteristics, Types of Firewalls, Firewall Configuration. Trusted System. (04)

Recommended Books:
PART A

The NCBI Data Model:

The GenBank Sequence Database:

Submitting DNA Sequences to the Databases:
Introduction: Why, Where and What to submit?, DNA/RNA, Population, phylogenetic and Mutation Studies, Protein-only submissions, How to submit on the World Wide Web, how to submit with Sequin updates, Consequences of the data model, EST/STS/GSS/HTG/SNP and Genome Centers.

Structure Databases:
Introduction to Structures, PDB: Protein data bank at the research collaboratory for structural file formats, Visualizing structural information, Database structure viewers, advanced structure modeling, Structures similarity searching.

PART B

Genomic Mapping and Mapping Databases:
Interplay of mapping and sequencing Genomic map elements, Types of maps complexities and pitfalls of mapping, Data repositories, and mapping projects and associated resources, Practical uses of mapping resource.

Sequence Alignment and Database Searching:
Introduction, The evolutionary basis of sequence alignment, The modular nature of proteins, optimal alignment methods, Substitution scores and gap penalties Statistical significance of alignments, Database similarity searching, FASTA, BLAST, Database searching artifacts, Position-Specific scoring matrices, Spliced alignments.

Predictive Methods using DNA Sequences:
Expressed Sequence Tags (ESTs):
What is EST? EST Clustering, TIGR Gene Indices, STACK, ESTs and Gene Discovery, The human Gene Map, Gene prediction in Genomic DNA, ESTs and Sequence Polymorphisms, Assessing levels of Gene expression using ESTs.

Practice Task:
(using PEARL)
1. Finding the length of a Sequence File
2. Pattern matching
3. Extracting Patterns

Recommended Books:
2. David W. Mount, “Bioinformatics: Sequence & Genome Analysis.”

ECE-6211 VLSI DESIGN

PART A

Introduction to VLSI:

CMOS Circuit and Logic design:

PART B

Design Methodology & Tools:
Design Methodology: Introduction, structured Design, Programmable logic, fully Custom design, CAD tools in VLSI Design Process.
Architecture Design: Introduction, HDLs, High level synthesis, Logic Synthesis. (11)

**VLSI Simulation and Algorithm:**
Hierarchy of simulation tools, Switch level simulations, Layout synthesis, Placements and routing algorithms, spice simulation. (12)

**Practice Task:**
Design & Simulation of combinational and sequential circuits using
1. Front End VLSI tools like Xilinx ISE, ISE simulator or Modelsim simulator.

**Recommended Books:**
1. CMOS VLSI design by Neil H.E. Weste, David Harris, Ayan Banerjee (Pearson Education)
2. Modern VLSI Design by Wayne Wolf (Pearson education)
3. FPGA-Based system design by Wayne Wolf (Pearson Education)
4. Introduction to VLSI Systems by Mead and Conway (Addison wisely)
5. VLSI Design by Puckneel.
THIRD SEMESTER

ECE-7101  NEURAL NETWORKS & FUZZY LOGIC

PART A

Fundamentals of Neural Networks:
Introduction, Biological Neurons and Memory, Structure & Function of a single Neuron, Artificial Neural Networks (ANN). Typical Application of ANN - Classification, Clustering, Pattern Recognition, Function Approximation. Basic approach of the working of ANN – Training, Learning and Generalization. (10)

Supervised Learning:

PART B

Unsupervised Learning:
Winner-takes all Networks, Hamming Networks. Adaptive Resonance Theory, Kohonen’s Self-organizing Maps. (09)

Neurodynamical models:
Stability of Equilibrium states, Hopfield Network, Brain-state-in-a-Box network, Bidirectional associative memories. (06)

Fuzzy Logic:
Basic concepts of Fuzzy Logic, Fuzzy Vs. Crisp set Linguistic variables, membership functions, operations of fuzzy sets, Crisp relations, Fuzzy relations, Approximate reasoning, fuzzy IF-THEN rules, variable inference, techniques, defuzzification techniques, Fuzzy rule based systems. Applications of fuzzy logic. (10)

Practice Task: (To be covered under theory class)
1. Design and train NN for AND or gate using perceptron
2. Design and train perceptron to classify odd and even numbers
3. Design and train NN for alphabet recognition using back propagation
4. Design and train Hopfield network for recognizing patterns such as ‘+’ and ‘−’
5. Design and train NN for EXOR classification using back propagation
Recommended Books:

1. Satish Kumar – Neural Network : A classroom approach
2. Jacek M.Zurada- Artificial Neural Networks
3. Simon Haykin- Artificial Neural Network
4. Rajasekaran & Pai – Neural networks, Fuzzy logic and genetic algorithms
6. T. J. Ross – Fuzzy logic with engineering applications.

ECE-7102 RF AND MICROWAVES

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

PART A

**Review of boundary conditions:** Wave-guides and Cavity resonates (rectangular, circular & cylindrical) passive Circuits (design principles), impedance transformers, filters, hybrids, isolates. Detail discussion on S-matrix. (10)

**High frequency semi-conductor devices:** Intel valley Scattering, Gunn diodes, IMPATT diodes, Step recovery diodes. Lumped elements: Equivalence circuits of Capacitors and Inductors, Design of lumped element resonators and circuits, Basic blocks in RF system and their VLSI implementation, Design of mixer, Basic topologies VCO and phase noise, Various RF Synthesizer architecture and frequency dividers, Design issues in integrated RF filters. Thin & Thick film technologies. (13)

PART B

**Design aspects:** Transmission lines for microwave circuits, Strip lines, Micro-strip lines, Slot line & Coupled lines. Characteristics impedance, Lumped parameters etc. Design considerations and implementation using simulation tools, Design of power dividers, combiners, and directional couplers (08)

**Microwave measurements:** SWR, Return loss, impedance, Scattering parameters, attenuation and familiarization with equipments such as vector network analyzer, Spectrum analyzer, power meters and their block diagrams discussion. Fabrication techniques in microwave. (10)

**Computational techniques for microwave:** moment method & Finite difference time Domain method. Comparison of Simulation Software for microwave applications. Computer aided design. (10)
Recommended Books:

1. B.Bhat & S.koul, Stripline- Loke Transmission lines for MICS, John Wiley
3. Y.Konishi, Microwave integrated Circuit, Marcel Dekker
4. S.Y.Liao, Microwave Circuit Analysis and Amplifier Design, PHI
5. B.Razavi, RF Micro-Elements, PHI.

ECE-7103 SIMULATION & MODELLING

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

PART A

Modelling:
State and events, abstraction, Modelling approaches, Graphical Analogue, Scaled, Model characteristics.  
(08)

System Simulation:
Technique of simulation, montecarlo method, Comparison and simulation with analytical method, numerical computation techniques.  
(10)

Probability Concepts in Simulation:
Stochastic variables, Discrete and continuous probability functions, Numerical evaluation, Random number generators, discrete distribution generation.  
(06)

PART B

Arrival pattern and Service Times:
Arrival patterns: poisson, Exponential distribution, Coefficient of variations, Service times, Queuing, Solution of queuing, Solution of Queuing problems.  
(04)

Discrete System Simulation:
Discrete events, Representation of time, Arrival patterns, Gathering statistics, Measuring utilization and occupancy.  
(05)

Analysis of Simulation Output:
(10)
**Statistical Interference:**
Regression, correlation and analysis of variance. Simulation kernels, Strong predicted events, Event cancellation.

(05)

**Practice Task** (To be covered under Theory)
Simulation using package software such as IE3D, FDTD, VHDL, SDL, EDL & other Communication Software.

**Recommended Books:**

1. Geoffrey Gordon System Simulation, Prentice Hall of India
2. Kishor S. Trivedi, Probability and statistics with Reliability, Queuing and computer Science Applications, Prentice Hall of India(EEE)
3. Narsing Deo, System Simulation with Digital Computer, Prentice Hall of India

---

**ECE- 7104**  
**NANO ELECTRONICS**

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PART A</strong></td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Materials for Nano-Electronics:**

(08)

**Properties of Individual Nanoparticles:**
Introduction to semi conducting Nanoparticles, introduction to quantum Dots, wells, wires, preparation of quantum nanostructures, Introduction to carbon nano tubes, Fabrication, Structure, Electrical properties, vibrational properties, Mechanical properties.

(08)

**Bio-logical Materials:**
Biological building blocks-polypeptide, nucleic acids- DNA, Biological nanostructure, Biological methods for Nano scale fabrication.

(08)
PART B

Tools:
TEM, Infrared and Raman Spectroscopy, Photoemission and X-RAY spectroscopy, Electron microscopy, SPMs, AFMs, Electrostatic force microscopy, Magnetic force microscopy. (06)

Nano-scale Devices
Introduction, Nanoscale MOSFET-Planer and non-planer, Resonant-tunneling diodes, Single electron transistor, Quantum-dot Nano-electromechanical systems, Molecular/Bio molecular electron devices. (15)

Recommended Books:
5. K.E. Drexler, Nano-Systems, Wiley (1922)

TQM-7105 TOTAL QUALITY MANAGEMENT

PART A

Achieving Excellence through TQM; Concept & definition of quality, Total Quality and TQM, Role and importance of TQM in Indian business industry,TQM Thinkers and their Contributions,TQM Vs management, Cost of Quality, Cost of Poor Quality, Applications of TQM in Service and ,manufacturing Sectors in India. (11)

Problem solving and QC tools;Statistical Process Control, SQC Vs SPC, Control Charts, Process capability, Failure mode effect analysis (FMEA), Taguchi Methods, Design of experiments (DOE), Just in Time (JIT), Waste Elimination, Fault tree analysis. (11)

Total employees involvement, Kaizen, Quality Circles, Team Work for Quality, Customer’s Satisfaction, Benchmarking. (06)
PART B

Leadership and Communication for Quality, Creating Quality Culture, Quality Planning Process, Housekeeping for Quality. (05)

Inspection Vs Prevention, Total Productive and Preventive Maintenance, RFT, QFD, Daily Process. Management, PDCA Cycle, BPR, Quality of Product Design and Service Quality; Product reliability, Validation and Verification. (10)

Acceptance Sampling, Six Sigma, Value Engineering, Lean Manufacturing, SMED, ISO 9000 and ISO 14000, Implementing TQM, Quality Audit, Quality Awards, Quality Information System, Quality of People, Quality in Marketing, Future of TQM in India. (11)

Recommended Books:

1. Total Quality Management, D.D. Sharma, Sultan Chand & Son, New Delhi, 2001
3. Total Quality Control, Armand Feigenbaum, 1991
4. Total Quality Control, Sarv Singh Soni
12. Kaizen-he Key to Japan’s Competitive Success, Imai M., 1986
18. Introduction to Quality Engineering, G. Taguchi, 1986
PART A

Introduction to Human Resource Development
Evolution Pre-industrial and Information age.
Mission and Purpose, Components of HRD, HRD problems and issues related to Indian Industry and technical education, HRD in the context of new industrial policy.

Stages of HRD
Initial or Induction Training for job-related /professional development Training for horizontal and vertically mobility of employees.

Training & Training Strategies
Training: Concepts, Assumptions- prevailing and alternative, phase in training, modalities of training, drawbacks in existing systems of training benefits of training. Six goals content and process orientation.

Training Methods
Off-the –job Training Methods-Coaching, Counseling, mentoring, reflective practices, subjects groups, observing classes of seniors/experts etc. Characteristics, merits and demerits of training methods

PART B

Developing Group and Climate
Social process: Three facets, Indicators of group development, the training Climate: personal and interpersonal dimensions

Evaluation of Training
Concept, purposes, types and issues in evaluation
Steps in designing evaluation of training.

Systematic approach to Design of Training Programme:
Concept of system, benefits of systematic approach to design of training programme, steps in systematic approach – need analysis, task analysis, entry behavior analysis, resource and constraints analysis, analysis of goals and objectives, Synthesis of criterion tests, Synthesis of contents, Synthesis of training methods and media, implementation of training methods and media, implementation of training, assessment of trainees’ performance, evaluation of training, improvement in training.
Recommended Books:


MTE 6202 RESEARCH METHODOLOGY

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

Introduction to Educational Research
Concept, types – basic, applied and action, Need for educational research

(6)

Reviewing Literature
Need, Sources – Primary and Secondary, Purposes of Review, Scope of Review, steps in conducting review.

(6)

Identifying and Defining Research Problem
Locating, analyzing stating and evaluating problem. Generating different types of hypotheses and evaluating them.

(8)

Methods of Research
Descriptive research design - survey, case study, content analysis, Ex-post Facto Research, Correlational and Experimental Research

(20)

Sampling Techniques
Concept of population and sample’ sampling techniques - simple random sampling, stratified random sampling, systematic sampling and cluster sampling, snow ball sampling, purposive sampling, quota sampling techniques. Determining size of sample.

(10)

Design and Development of Measuring Instruments, Tests, questionnaires, checklists, observation schedules, evaluating research instruments, selecting a standardized test.

(12)

Procedure Of Data Collection
Aspects of data collection, coding data for analysis

(6)
**Statistical Methods of Analysis**
Descriptive statistics: Meaning, graphical representations, mean, range and standard deviation, characteristics and uses of normal curve.
Inferential statistics: t-test, Chi-square tests, correlation (rank difference and product moment), ANOVA (one way), Selecting appropriate methods. (14)

**Procedure for Writing a Research Proposal**
Purpose, types and components of research proposal. (4)

**Procedure for Writing a Research Report**
Audiences and types of research reports, Format of research report and journal articles. (4)

**Strategies for Evaluating, Research** disseminating and utilizing research – An Overview

**Practice Tasks**
- Define a research problem in polytechnic education/industry after studying problem situation and literature
- Given the purpose, objectives of research, write hypotheses
- Select research designs for the given research objectives
- Identify the measuring instruments for the given research objectives/hypotheses
- Identify the appropriate statistical methods of analysis for the given research proposal.
- Critically analyse the given research reports on various aspects such as hypothesis, design, measuring tools, statistical analysis, interpretation etc. to identify the gaps or weaknesses in the study.

**Recommended Books:**

3. CPSC: Developing Skills in Technician Education Research Modules 1 to 11 Singapore, Colombo Plan Staff College for Technician Education
MTE 6207 ENTREPRENEURSHIP DEVELOPMENT

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

**Nature and Scope of Entrepreneurship** - Need and Philosophy of entrepreneurship
Characteristics of an entrepreneur; Entrepreneur vs. Self-employment; Intrapreneuring;
Role of entrepreneurship in Indian economy, Entrepreneurship and innovation; Indian
values and entrepreneurship. (10)

**Entrepreneurial Support System** - Three Tiers of Entrepreneurial Support System;
Assistance from National level Organizations like SIDO, NSIC, SIDBI, IFCI, IDBI,
ICICI, NRDC etc. Assistance from State level organizations like DOI, DIC, SSIE, SISI,
SFCs, Commercial Banks etc; Special schemes for technical entrepreneurs and women.
Incubation Centers, Awareness camps. (10)

**Product Identification** – Identification of Opportunities, Consideration for product
selection; Exposure to demand based, resource based, service based, import substitute,
export promotion, trading and consultancy ventures. (10)

**Entrepreneurial Motivation Training** - Programme clarity – sharing expectations and
unfreezing and refreezing; Data collection about self `who am I` write up. Introduction to
need system and motivational pattern of entrepreneur (conceptualizing entrepreneurial
skills and behavior).
Risk taking behavior, hope of success, fear of failure, learning from feedback (Ring Toss
Game).
Through entrepreneurial camps &Incubation centers.
Analyzing motive strengths, locating achievements imageries, intensity of motive
(Assessing TAT stories, group and individual level). Personal efficacy, defining,
individual life goal, its linkages to entrepreneurship, locus and control, conceptualizing
entrepreneurial values.
Planning and goal setting, help and resource use, creativity and divergent thinking,
confidence building learning from feedback (Business Games and Exercises).
Achievement Planning (APO) Games
Tolerance to ambiguities and Commitment to entrepreneurial goal (Interaction with
successful entrepreneurs).
Leadership and Influencing abilities, guidance and help (Block Building Exercises, role
playing exercises).
Entrepreneurial goal setting, sharing entrepreneurial goal, devising clarity in terms of
enterprise building. (15)

**Project Formulation Process** – Preparing list of relevant projects; Process of selecting a
project and zeroing on different projects for potential entrepreneurs. Steps in planning a
small scale industry. Techno-economic feasibility analysis of projects.
Structure of a project report.
Analysis of sample project report. Preparation of final project report.
Product design and development. (15)

Planning of Small and Medium Enterprises
Production Management – Production Planning and Scheduling; Materials Management; Inventory management; Technology selection, transfer and management.


Marketing Perspectives – Relevance of Marketing for entrepreneurship; Product planning; Pricing decision; Place policies; Advertising and sales policies; Market survey and Demand estimation for selected projects.

Personnel Management and Industrial Relations – Procurement, Development, Compensation, Integration, Maintenance functions; Leadership, Communication and Motivation skills. (15)

Practice Task:
- Visit to small and medium enterprises and interacting with entrepreneurs.
- Visit to support agencies and gathering relevant entrepreneurial information.
- Gathering information about viable projects identified by support agencies.
- Preparation of preliminary project report.
- Preparation of detailed project report.
- Calculation of important financial ratios so as to ascertain techno-economic feasibility of the proposed venture.

To prepare and deliver class seminars on industrial and commercial legislation.

Recommended Books:

1. Gupta, CB and Srinivasan, NP; Entrepreneurial Development, New Delhi, Sultan Chand & Sons.
7. Sharma DD and Saini, JS: Enterprise Edge, Rawat Publications, Jaipur. Sharma DD and others: Training Modules on Entrepreneurship Development

MTE 7103 TECHNOLOGY MANAGEMENT

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

Business Strategy for new Technologies: adding value, gaining competitive advantage, timing and capability development. (10)

Technology Forecasting: Techniques of Forecasting, Technology Forecasting-Relevance, Strategic alliance and Practicality, and Technology transfer. (10)

Technology Forecasting: Techniques of Forecasting, Technology Forecasting-Relevance, Strategic alliance and Practicality, and Technology transfer. (10)

Management of research, development and innovation:
Technology mapping of type of R&D projects and development approaches-radical platform and incremental projects, innovations. (10)

Management of Intellectual property Rights:
Strategic value of patents, trade secrets and licensing. (10)

Management scientist and technologist: Identification, recruitment, retention, Team work and result orientation, investment in technology. (10)

Management roles and skills for new technology (10)

Technology for Managerial Productivity and effectiveness, Just in Time. (10)

Venture Capital and Technology Development. (10)

Recommended Books:

1. Technology and Management: by Cassell Educational Ltd., London
7. New Product Management: by C marle Crawford IRWIN, USA