M.Sc. ELECTRONICS

1. Introduction: -
M.Sc. Electronics is a four-semester course spread over the period of two years. The Department of Electronics, Shivaji University, Kolhapur, offers this course on its campus. It is designed to offer in depth knowledge of the subject starting from its basic concepts to the state-of-art technologies in use today. Students are also provided extensive laboratory training on the course content and the current requirements of industries and R & D. In the second year every student has to undertake a project, which is based on the specialization, he/she opts for. Four specializations are offered to the students in the areas of communications, Embedded Systems, Power Electronics and Computer Applications. Special feature of the course is the inclusion of Mathematical Techniques at Sem-I and Signal and System at Sem-II with the objective of strengthening the mathematical foundations of Electronics students. In addition the course caters to the requirements of providing complete exposure to NET/SET syllabi for Electronics framed by the U.G.C.

2. Advantages of the course: -
The course revised in the year 2011 to be implemented from the academic year June 2012 provides exposure to the technologies in-vogue and trains them to take up projects relevant to the industrial needs, the R & D activities and self-employment opportunities. The student after passing the M.Sc. course has many opportunities of employment, self-employment and higher studies.

Employment Opportunities: -
- Electronics and Telecommunication Industries.
- I.T. Industries (India and Abroad).
- Process and Manufacturing Industries.
- Research and Development Laboratories.
- Employment in Academic and Other Govt. Organizations.

Educational Opportunities: -
- Research in Shivaji University or any other University. M.Phil, M.Tech. and Ph.D.
- M.Tech. /M.E courses of Various Universities in India and Abroad.
- Higher Studies Like M.S. in relevant discipline and Research Opportunities in foreign universities.
Revised M.Sc. Syllabus 2012-13  
Department of Electronics,  
Shivaji University, Kolhapur

- Joining Special courses on current technologies at Pune, Bangalore, Mumbai, and CEDT.

3. Objectives of the Courses: -
The course is designed with a view to cater the present day requirements in Industries, R & D fields, higher studies and Self-employment. Moreover the course structure intends to inculcate strong laboratory skills so that the student can take up independent projects which will help to be an entrepreneur. The students passed out from the revised course will serve as quality human resource to take up the state-of-art research work of the Department.

4. Title of the Course :  M.Sc. Electronics

5. Eligibility of the Course:

1.1.
Any students who has obtain the degree of B.Sc. of this University or the degree of any other statutory University recognized as equivalent, and has kept four semester terms in the University as a postgraduate student be admitted to the examinations for the degree of Master of Science in any of these subjects mentioned in R.M. Sc. No.3.

1.2
Any students shall be held eligible to the admission to the M.Sc. course provided he/she has passed the B.Sc. examination either with the principal subject or with a subsidiary / interdisciplinary / applied / allied subjects and has passed the entrance examination conducted by the University.

1.3
The students with B.Sc.(General Course) from other University shall be eligible if they qualify through the entrance examination and they score minimum 55% i.e. B+ marks in the subject at the B.Sc. examinations.

6. Fees for the Course

<table>
<thead>
<tr>
<th>Class</th>
<th>Total Fees, Paying</th>
<th>Total Fees, EBC/PTC / STC/ Maji Saineek / FF</th>
<th>Total Fees, SC/NT/ST / OBC/ SBC</th>
<th>Total Fees, Paying</th>
<th>Total Fees, EBC/PTC / STC/ Maji Saineek / FF</th>
<th>Total Fees, SC/NT/ST / OBC/ SBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.Sc. Part I</td>
<td>Rs. 2790/-</td>
<td>Rs. 1610/-</td>
<td>Rs. 650/-</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>M.Sc. Part II</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>Rs. 2640/-</td>
<td>Rs. 1460/-</td>
<td>Rs. 500/-</td>
</tr>
</tbody>
</table>

For foreign students tuition fees is Rs. 5000/- per year.

Note : Fee Structure as revised by University from time to time.
7. **Strength of the Students:**

The intake capacity is 36 + 10% of intake capacity permissible depending upon admission policy guidelines of the university for the academic year.

8. **Admission/Selection procedure:**

The admission to the M.Sc. Electronics course is by entrance examination. 50% of the marks scored in the entrance examination and 50% of the marks scored in the final year examination are added to prepare the merit list and admissions are given strictly on the basis of merit and following the rules of University for admission. The admission will be by round and the information regarding entrance examination result and the round of admission will be put up on the Shivaji University website: [www.unishivaji.ac.in](http://www.unishivaji.ac.in)

9. **Duration of the Course:**

M.Sc. Electronics is a two year, four semester full time course.

10. **Period of the Course:**

From June to April end as specified in the University Calendar from time to time.

11. **Teacher’s Qualifications:**

As prescribed by UGC from time to time.

12. **Credit system implementation**

M.Sc. Electronics is a four semester course. Every semester course consists of four theory courses and two laboratory courses each carrying weightage of 100 marks (4 credits). However, in the final semester, there will be one project in lieu of one practical. In order to qualify for two-year master’s degree a student must acquire minimum of 40 credits (10 credits each semester) which are distributed as given below.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particular of Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>compulsory courses</td>
<td>20</td>
</tr>
<tr>
<td>2.</td>
<td>elective courses</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td>practical courses including project</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

The candidates securing grade point less than 4 (b grade) shall be declared to have failed in that subject. Under such circumstances his SGPA, CGPA and FGPA will not be calculated.
Credit as defined is the workload of a student in
1. Lectures
2. Practicals
3. Seminars
4. Private work in the library/home
5. Examination
6. Other assessment activities

The credit system permits students to
- Learn at their own pace.
- Choose electives from a wide range of elective courses offered by the University departments.
- Undergo additional courses and acquire more than the required number of credits.
- Adopt an inter-disciplinary approach in learning.
- Make best use of the expertise of available faculty in and out of department.
Semester - I

<table>
<thead>
<tr>
<th>Paper</th>
<th>Theory</th>
<th>Practical</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Internal</td>
<td>External</td>
<td>Internal</td>
<td>External</td>
</tr>
<tr>
<td>ELE 11 Audio and Video</td>
<td>20</td>
<td>80</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELE 12- Power Electronics</td>
<td>20</td>
<td>80</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>ELE 13 – Microwave Technology – I</td>
<td>20</td>
<td>80</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>ELE 14 - Computer Organization</td>
<td>20</td>
<td>80</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>ELE 15 - Mathematical Techniques</td>
<td>50</td>
<td>---------</td>
<td>---------</td>
<td>50</td>
</tr>
<tr>
<td>Practical course - I</td>
<td>---------</td>
<td>---------</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Programming Language I</td>
<td>---------</td>
<td>---------</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>Mini-Project I</td>
<td>---------</td>
<td>---------</td>
<td>10</td>
<td>40</td>
</tr>
</tbody>
</table>

SEM- II

<table>
<thead>
<tr>
<th>Paper</th>
<th>Theory</th>
<th>Practical</th>
<th>Total</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Internal</td>
<td>External</td>
<td>Internal</td>
<td>External</td>
</tr>
<tr>
<td>ELE 21- Control Theory</td>
<td>20</td>
<td>80</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>ELE 22- PIC and RTOS</td>
<td>20</td>
<td>80</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>ELE 23 - Analog and Digital Circuit Design</td>
<td>20</td>
<td>80</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>ELE 24 – Microwave Technology–II</td>
<td>20</td>
<td>80</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>ELE 25- Signals and Systems</td>
<td>50</td>
<td>---------</td>
<td>---------</td>
<td>50</td>
</tr>
<tr>
<td>Practical Course – II</td>
<td>---------</td>
<td>---------</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Programming Language-II</td>
<td>---------</td>
<td>---------</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>Mini-Project II</td>
<td>---------</td>
<td>---------</td>
<td>10</td>
<td>40</td>
</tr>
<tr>
<td>Paper</td>
<td>Theory</td>
<td>Practical</td>
<td>Total marks</td>
<td>Credits</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------</td>
<td>-----------</td>
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<tr>
<td></td>
<td>Internal</td>
<td>External</td>
<td>Internal</td>
<td>External</td>
</tr>
<tr>
<td>ELE 31 Computer Networking</td>
<td>20</td>
<td>80</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>ELE 32- Digital Signal Processing</td>
<td>20</td>
<td>80</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>ELE 33 – ELECTIVE - I</td>
<td>20</td>
<td>80</td>
<td>----------</td>
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</tr>
<tr>
<td>ELE 34 – ELECTIVE - II</td>
<td>20</td>
<td>80</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>ELE 35- Technical Writing (Non-Credit)</td>
<td></td>
<td></td>
<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td>Practical course - III</td>
<td></td>
<td></td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Project</td>
<td></td>
<td></td>
<td>20</td>
<td>80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Paper</th>
<th>Theory</th>
<th>Practical</th>
<th>Total marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Internal</td>
<td>External</td>
<td>Internal</td>
<td>External</td>
</tr>
<tr>
<td>ELE 41 Mechatronics</td>
<td>20</td>
<td>80</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>ELE 42- Advanced Industrial Control</td>
<td>20</td>
<td>80</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>ELE 43 – ELECTIVE I</td>
<td>20</td>
<td>80</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>ELE 44 – ELECTIVE II</td>
<td>20</td>
<td>80</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>ELE 45 –Project Management (Non-Credit)</td>
<td></td>
<td></td>
<td>-----------</td>
<td>----------</td>
</tr>
<tr>
<td>Practical course – IV</td>
<td></td>
<td></td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Project</td>
<td></td>
<td></td>
<td>20</td>
<td>80</td>
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</tbody>
</table>
## ELECTIVES

### SEM –III

<table>
<thead>
<tr>
<th>Elective Groups</th>
<th>Papers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Embedded System</strong></td>
<td>ELE-33. FPGA Based System Design</td>
</tr>
<tr>
<td></td>
<td>ELE-34. Microcontroller Based System Design and ARM Architecture</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>ELE-33. Digital Communication</td>
</tr>
<tr>
<td></td>
<td>ELE-34. Satellite Communications</td>
</tr>
<tr>
<td><strong>Power Electronics</strong></td>
<td>ELE-33. Industrial Automation</td>
</tr>
<tr>
<td></td>
<td>ELE-34. Microcontroller Based System Design and ARM Architecture</td>
</tr>
<tr>
<td><strong>Computer Applications</strong></td>
<td>ELE-33. Soft Computing</td>
</tr>
<tr>
<td></td>
<td>ELE-34. Advances in Software Design</td>
</tr>
</tbody>
</table>

### SEM –IV

<table>
<thead>
<tr>
<th>Elective Groups</th>
<th>Papers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Embedded System</strong></td>
<td>ELE-43. ARM Programming and Embedded Communication Protocols</td>
</tr>
<tr>
<td></td>
<td>ELE-44. System Design using EDA Tools</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>ELE-43. Fiber Optics Communications</td>
</tr>
<tr>
<td></td>
<td>ELE-44. Cellular Mobile Communications</td>
</tr>
<tr>
<td><strong>Power Electronics</strong></td>
<td>ELE-43. Power Electronics Circuit Analysis &amp; System Design</td>
</tr>
<tr>
<td></td>
<td>ELE-44. Advanced Drives and Controls</td>
</tr>
<tr>
<td><strong>Computer Applications</strong></td>
<td>ELE-43. Computer Algorithms</td>
</tr>
<tr>
<td></td>
<td>ELE-44. Advanced Computer Networking.</td>
</tr>
</tbody>
</table>
How much time a student gives for the examination per semester?

1) Four Theory papers per semester each of 3 hours duration. Total time required is 12 hours
2) Two practical papers with 2 experiments per paper. Total 4 Practicals each of 3 hours duration. Total time required is 12 hours.

Total time for a semester examination is 12 + 12 = 24 hours.

Time required for the other activities.

- Seminars – as per the requirement of the course
- Discussions - as per the requirement of the course
- Library – Book issue, Journal reference, Internet access. Reading magazines and relevant information
- Private work – Project material, Books purchase, Xerox, availing outside facilities etc

Types of credits

1. Credit by examination – Tests (theory and Practicals), Seminars
2. Credit by non examination – Proficiency in state National and International sports achievements, Social service (NSS), Military services (NCC), Colloquium and debate, Cultural programs etc.

Credits by lectures and practicals

- 1 credit is equivalent to 15 contact hours
- Total instructional days as per the UGC norms are 180
- For the M.Sc. course there are 4 theory papers with 4 hours teaching per week. Therefore the instructional days for theory papers in a semester are 4 x 15(weeks) = 60 days.
- There are 2 practicals each of 3 hrs. duration for the one practical paper.
- There is 1 practical of 3 Hrs. duration for Programming language
- There is 1 Miniproject of 3 Hrs. duration.
- The total practical workload is of 12 hours. Thus the instructional days for the practical course of 4 practicals are 2(practical papers) x 15 = 30 days.
- The time for which a student is busy in a semester is 60(theory) + 30(practical) = 90 days.
- With 4 credits per subjects there will be 4 x 4 = 16 credits for the theory papers and 4 x 2 = 8 credits for the practicals. Every practical /project of 50 marks carries 2 credits.
Number of credits for the M.Sc. course per semester will be 16+8 = 24.
Total number of credits for the entire M.Sc. course will be 4 x 24 = 96.

At M.Sc. I and II the students are taking two courses in Mathematical Techniques. For which there shall be 2 credits at SEM-I and 2 credits at sem-2. These 4 credits at M.Sc. - I will be awarded on the basis of unit-wise tests conducted internally by the department for these two papers.

Total credits for M.Sc. Course = 96 + 4 = 100.

Total credits for the M.Phil. Course are 24

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particulars of Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Theory</td>
<td>12</td>
</tr>
<tr>
<td>2.</td>
<td>Seminar</td>
<td>02</td>
</tr>
<tr>
<td>3.</td>
<td>Dissertation</td>
<td>08</td>
</tr>
<tr>
<td>4.</td>
<td>Viva-voce</td>
<td>02</td>
</tr>
<tr>
<td><strong>Total Credits</strong></td>
<td></td>
<td><strong>24</strong></td>
</tr>
</tbody>
</table>

**The implementation of the credit system:**

- Under the credit system every semester duration will be of at least 15 weeks.
- The examination must be scheduled in one month’s time.
- The students must get at least 3 weeks time for the examination preparations.
- Every theory paper syllabus should consist of 4 units (sub units allowed) each carrying 1 credit.
- In order to have uniformity in the credit transfer internal examination, all the P.G. departments shall have equal weightage of 80 external +20 internal.

<table>
<thead>
<tr>
<th>Theory paper</th>
<th>Contact hours</th>
<th>credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit –I (sub units if any)</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Unit –II (sub units if any)</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Unit –III (sub units if any)</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td>Unit –IV (sub units if any)</td>
<td>15</td>
<td>1</td>
</tr>
</tbody>
</table>

**The practical course credit distribution for Sem I and II**

<table>
<thead>
<tr>
<th>Practical paper</th>
<th>practical</th>
<th>contact hours</th>
<th>credits</th>
<th>no of practicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit –I</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Unit –II</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Unit –III</td>
<td>Programming Language</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Unit –IV</td>
<td>Miniproject</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>
• The practical course credit distribution for Sem III and IV

<table>
<thead>
<tr>
<th>Practical paper</th>
<th>practical</th>
<th>contact hours</th>
<th>credits</th>
<th>no of practicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit –I</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Unit –II</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Unit –III</td>
<td>Project</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Unit –IV</td>
<td>Project</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

• A project of 100 marks will carry 4 credits. Where a project of 100 marks is offered to the student, the student will have to perform 1 project and 1 practical paper (two practicals) for semester III and IV.

Time for the explanation for the practical course (contact hours) will be one week (12 hrs).

• This makes the practical workload of a student equal to 30 days in a semester.

Grades, grade point and average grade points calculations

• Table showing the grades, grade points and marks scored by a student

<table>
<thead>
<tr>
<th>Grades</th>
<th>Grade points</th>
<th>Marks out of 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>9</td>
<td>91 to 100</td>
</tr>
<tr>
<td>A</td>
<td>8</td>
<td>81 to 90</td>
</tr>
<tr>
<td>A-</td>
<td>7</td>
<td>71 to 80</td>
</tr>
<tr>
<td>B+</td>
<td>6</td>
<td>61 to 70</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>51 to 60</td>
</tr>
<tr>
<td>B-</td>
<td>4</td>
<td>41 to 50</td>
</tr>
<tr>
<td>C+</td>
<td>3</td>
<td>31 to 40</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>21 to 30</td>
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<tr>
<td>C-</td>
<td>1</td>
<td>11 to 20</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>0 to 10</td>
</tr>
</tbody>
</table>

Seminar Grade Point Average (SGPA):- It is a semester index grade of a student.

1. Seminar Grade Point Average (SGPA):- It is a semester index grade of a student.

\[
SGPA = (g_1c_1 + g_2c_2 + \ldots + g_6c_6) / \text{Total credits offered by the student in a semester.}
\]

2. Cumulative Grade Point Average (CGPA):- It is a cumulative index grade point average of a student

\[
CGPA = (g_1c_1 + g_2c_2 + \ldots + g_6c_6) / \text{Total number of credits offered by a student upto and including the semester for which the cumulative average is required.}
\]

3. Final Grade Point Average (FGPA):- It is a final index of a student in the course

\[
FGPA = (n / \sum c_i x g_i) / (n/ c_l)
\]

Where c_i - credit of the course (paper) (4)

g_i - grade points secured (see the table for conversion)

n - number of courses (number of papers offered)

cl - Total number of credits for the entire M.Sc course (96)
Illustration with an hypothetical case:

<table>
<thead>
<tr>
<th>For M.Sc I.(or II/III/IV)</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Papers</td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
</tr>
<tr>
<td>2. Credits</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3. Grade points obtained</td>
<td>7</td>
<td>6</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>4. $\sum c_i \times g_i$</td>
<td>28</td>
<td>24</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>5. $\frac{\sum c_i \times g_i}{c_l} = \frac{164}{24} = 6.83$</td>
<td>28</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Overall grade</td>
<td>6.83</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The cumulative grade point average is the sum of SGPA of a student in every semester.

Suppose it is 164 (6.83) for Sem-I, 170 (7.08) for Sem-II, 168(7.0) for Sem-III and 176(7.33) for Sem-IV,

The cumulative average for Sem -I and Sem-II will be = $\frac{334}{48} = 6.958 = 6.96$.

Final Grade Point Average for all the semesters = $\frac{678}{96} = 7.0265 = 7.03$

Rules to obtain the credits:

1. A student from the same department only will be eligible for opting for the Elective of his/her choice.

2. It will be mandatory for a student admitted for a Elective Group to opt for at least three papers related to that Elective Group. One paper can be offered as credit from other elective group.

3. A student from the other department will be offered credits of his choice in multiples of 4. A theory paper or the practical course can be offered as the credit. However number of such admissions will depend upon the seats available, classroom seating capacity and the laboratory facilities.

4. Core Courses - Core courses are those, knowledge of which is deemed essential for students registered for a particular Master’s programme. As such all core courses shall be mandatory and a student must pass in all the core courses prescribed for the programme. Core courses shall be uniformly spread over all four semesters.

5. Elective/specialization Courses - Elective courses are intended to:
   - Allow students to specialize in one or more branches of the broad subject area; or
   - Acquire knowledge and skills in a related area that may have applications in the broad subject area; or
   - Bridge any gap in the curriculum and enable acquisition of essential skills (e.g. statistical,
computational, language, communication skills, etc); or

➢ Help pursue an area of interest to the student

6. Students are encouraged to have credits from the Management course.

7. Students can select any one elective group for SEM-III and SEM- IV.

8. Students are able to take any one paper from any other elective group during SEM-III and SEM- IV. (such a transfer is allowed based on the availability of seats)

9. Additional Credits can be obtained by any student during Sem III and IV (maximum 4 credits for each semester). These additional credits are not added to main credits and can be considered as extra credit.

10. Attendance: As per the university rule the attendance of the student must be at least 75 %. For attendance in the classroom or laboratory student will have to sign the attendance sheet. Merely ‘P’ for present or ‘A’ for absent will not be considered valid.

11. A teacher offering the course will be responsible for maintaining the attendance and the performance sheets of all the students offering that course.

Nature of the internal examination:

 For every theory paper there will be two internal examination(s) carrying 20 marks each. The average of the marks scored in these two examinations will be taken for the final score out of 20.

 The nature of this examination will be as follows.

There will be two questions asked in the internal examination.
Test-1 will carry 20 marks and it will be short answer type (any 5 out of 7 each carrying 4 marks)
Test-2 will carry 20 marks and it will be objective type (Part-A multiple choice and Part-B true or false)

No student will be allowed to take reexamination if he/she remains absent unless the reason is genuine.

The decision regarding such cases will be taken in a Department committee meeting. The result of the internal assessment will be declared after one week from the date of examination. The student will be shown the answer papers by the concerned teachers.

The assessment of the practicals (examination): -

1) Every practical a student performs day to day in the laboratory shall be of three hours durations. A student will have to write his journal sheet for the experiment that he/she has performed in the laboratory on the very day and get the same checked from the concerned teacher before leaving the laboratory.

2) The experiments distribution semester-wise shall be as follows:
There will be at least 12 experiments for every semester up to IV semester for practical course I, II, III and IV.

For programming language I and II 18 practical each.

3. The total number of experiments to be performed by the student during his/her four semesters shall be as detailed below.

<table>
<thead>
<tr>
<th>Semester</th>
<th>No of Experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>12 (Practical Course – I) + 6 (Programming Language-I) + 6(Mini-project)</td>
</tr>
<tr>
<td>II</td>
<td>12 (Practical Course – II)+ 6(Programming Language-II) + 6(Mini-project)</td>
</tr>
<tr>
<td>III</td>
<td>12 (Practical Course – III)+12(Project Phase I)</td>
</tr>
<tr>
<td>IV</td>
<td>12 (Practical Course – IV)+12(Project Phase II)</td>
</tr>
</tbody>
</table>

The project work will be distributed over the Semester III and IV.

**M.Sc. ELECTRONICS COURSE**

The course numbering is of the type ‘**ELE XY Title**’ ELE stands for Electronics

- **X** stands for semester
- **Y** stands for paper number
- **Title** stands for title of the paper
Structure and titles of the Semester Courses.

ELE-11 Audio and Video Engineering

Unit I

**Audio Systems:** Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying systems, Equalizers and Mixers, Electronic music synthesizers, Commercial Sound, Theater sound system.

Unit II

**Recording and Reproduction Systems:** Disc recording, Magnetic recording, Video tape recording, VCD and DVD recording, Dish antenna, Distortion and Noise reduction in Audio and Video System, Wireless reading device and Wi-Fi

Unit III

**Television systems:** PAL, NTSC and SECAM.

**Video Systems:** Monochrome TV, Colour TV standards, Luminance and chrominance signals, Video Telephone and Video Conferencing, Video text service, Digital TV, HDTV, Satellite TV, 3DTV.

Unit IV

**Developments:** Image formatting, Data compression, UTRC test charts, and Remote controls.

**Displays:** TFT-LCD, LED, OLED, QLED.

Reference Books:

3. A. M. Dhake, Television engineering, Tata Mc Graw Hill
5. Kiver, Kaufman, Television Electronics, Golgotia Publication
7. Guy E. Blelloch, Introduction to Data Compression, blelochcs.cmu.edu, Sep. 2010
ELE- 12 Power Electronics

Unit 1. AC to DC Converter
Revision of single phase converter, power factor improvement, single phase dual converter and series converter, Three phase half converters with resistive and Inductive loads, three phase semiconverter with resistive and inductive load. Three phase full converter with resistive and inductive load.

Unit 2. Chopper
Introduction, Classification of choppers, Control strategies, stepup and stepdown chopper, Class A, Class B, Class C, and Class D chopper, current and voltage commutated chopper.

Unit 3. Inverters
Introduction, Classification of Inverters, Transistorized Inverters, Single phase half bridge and full bridge with resistive and inductive loads, voltage control techniques for single phase inverters, series inverters, parallel inverters, Thyristorised inverters, three phase transistor inverters(120 & 180 conduction).

Unit 4. Power conditioners and applications
Transient suppression, EMI, RFI, CVI, voltage regulators, tap changing regulators, solid state regulators, UPS (online and offline), reliability of UPS system, Batteries used for UPS and Comparison of UPS system. Application of Power Electronics - RF heating, Dielectric Heating, Electronic Blast

Reference Books :
3. Power Electronics: Circuits, Devices and Applications, Muhammad H. Rashid, Pearson Education India, 01-Sep-2003
4. Power Electronics –C.W.Lander(MHI Publication
ELE- 13 Microwave Technology - I

Unit 1: Electromagnetic Waves
Microwave spectrum, Microwave applications, electric field, magnetic field, Maxwell’s equations, Conditions at a boundary surface, em waves in in a homogeneous medium- solution for free-space conditions, uniform plane-wave propagation, uniform plane waves, wave equations for a conducting medium, Sinusoidal time variations, conductors and dielectrics, polarization, reflection by perfect conductor-normal incidence, reflection by a perfect conductor-oblique incidence, reflection by perfect dielectric-normal incidence, reflection by a perfect insulator, conductor-oblique incidence, Poynting vector

Unit 2: Transmission Lines
Distributed constants of a line, A-C steady state solution for Uniform line, Variation of Zo, α and β with frequency, Various exponential forms of A-C steady state solution, solution in terms of Eg, Zg and Zr, hyperbolic form of the solution, Interference and standing wave patterns, insertion ratio and insertion loss, Half-wavelength and Quarter wavelength lines, short sections as circuit elements, measurement of standing waves, impedance matching, Coaxial connectors, Smith chart

Unit 3: Waveguides, cavity resonators and Passive Microwave Devices
Solution of wave equations in rectangular and circular waveguides, TE and TM modes, power loss and power transmission, excitation of modes, characteristics of standard waveguides, field components of rectangular cavity resonators, expression for Q.

Passive Microwave Devices
Terminations, Attenuators, Phase changers, directional couplers, Hybrid Circuits, Faraday rotation, Gyrator, Isolator, circulator, S parameters

Unit 4: Microwave Tubes and Solid state Devices
Limitations of conventional tubes at microwave frequencies, Klystrons-Reentrant Cavities, velocity-modulation process, bunching process, output power and beam loading, Multicavity Klystron Amplifiers-beam-current density, output current and output power of two-cavity klystron, Reflex Klystrons-velocity modulation, power output and efficiency, electronics admittance, Helix Traveling-wave tubes(TWTs)-slow wave structures, amplification process, convection current, axial electric field, wave modes, gain consideration, Magnetron Oscillators- cylindrical magnetron Microwave solid state devices - Tunnel diode, GaAs diode, LSA diode, InP diode, CdTe diode, Read diode, IMPATT diode, TRAPATT diode and BARITT diode.
Reference Books:

ELE- 14 Computer Organization

Unit 1:
Introduction: Computer system organization – hardware and software components, Operating system, Computer booting process, Instruction set architectures, Chronology of Microprocessor Development w.r.t. CISC families such as INTEL, AMD and MOTOROLA, RISC families, development of POWER PC, Alpha SPARC. Overview of Operating systems.

Unit 2:

Unit 3:
Parallel Processors – Flynn’s taxonomy. SIMD, MIMD and multi-computer approaches.
Implementation Considerations: memory technologies, Hierarchical Memory Systems, caches, prefetching techniques, virtual memory, pipelining, ternary logic, packaging considerations, wafer scale integration.

Unit 4:
Implementation of Functional Units: Memory Management, Arithmetic Logic Unit, Floating Point Unit, Branch Unit, Vector Unit, Load/Store Unit. Development Tools: Microcomputer Development Systems (MDS), In Circuit Emulator (ICE), Assembler, Editors, Logic Analyser.

Text / Reference Books:
5. Stallings, Computer Organization
ELE - 15 Mathematical Techniques

Unit 1 – Functions, Limits and Continuity:
Real functions and their graph, concept of limit of function, concept of continuous function.

Unit 2 – Differentiation:
Derivative at a point, interpretation of a Derivative at a point, derivative of a function. Differentiability, product rule, quotient rule, derivative of implicit and logarithmic function.

Unit 3 – Integration:
Infinite integrals, geometrical interpretation, properties of indefinite integrals. Integration by parts, Partial fraction, substitution.

Unit 4 – Fourier Series:
Definition of Fourier Series, calculation of coefficients in easy cases, elementary proportion, Fourier series exponential term, Fourier analysis of half, full wave rectifiers, sweep circuits.

Unit 5 – Laplace Transform:

Reference Books:
SEM - II
ELE- 21 Control Theory

Unit 1: Introduction:
Basic Concepts of Control System, Open loop and Closed loop systems, Classifications, effect of feedbacks on Control System performance. Transfer function, modeling and representation of Control system, concept of pole and zero, Linear mathematical physical systems, Electrical analogy, Block reduction techniques, Signal flow graph, Mason’s gain formula.

Unit 2: Time Domain Analysis and stability

Unit 3: Frequency Domain and State Variable Analysis

Unit 4: Control system components and controllers (only theoretical treatments)
Modeling and transfer function of control system components- Potentiometer, DC and AC Servomotors, gear trains, tacho-generators. Design concepts of P, PI, PD, PID controllers, Compensator Networks-lag and lead.

Reference Books:
3. Kuo B.C. Automatic Control System, PHI, New Delhi
4. Schaum’s Series book “Feed back Control Systems”.
ELE- 22 PIC and RTOS

Unit 1)
Introduction to microchip PIC microcontroller: PIC microcontroller features, scaling of PIC MCU families, overview of baseline, midrange, enhanced midrange, and high-end core devices.
Core architecture: PIC Architecture, Program memory, Addressing Modes, Instruction set.
MPLAB IDE overview: Using MPLAB, Toolbars, Select Development Mode And Device Type, Project, Text Editor, Assembler, MPLAB Operations.

Unit 2)
PIC MCU Hardware: reset, clock, control registers, register banks, program memory paging, Ports, interrupts, Timer and Counter, watchdog timer, power up timer, sleep mode, state machine programming.
Overviews of PIC tools – Development softwares, compilers, debug tools.

Unit 3)
Introduction to RTOS, Scheduler, objects, services. Tasks, task states and scheduling, synchronization, communication and concurrency.
Kernel objects: Semaphores, queues, pipes, event registers, signals, and condition variables.
Exceptions and interrupts: Introduction, Exception v/s Interrupt, Applications of exceptions and interrupts.

Unit 4)
RTOS concepts: Timer and timer services: Introduction, Real-time clock and system clock, Programmable interval timers, Timer ISRs, Timing wheels, soft timers.
I/O subsystem: Basic I/O concepts, The I/O subsystem. Memory Management: Introduction, Dynamic memory allocation in Embedded systems, Fixed-size memory allocation, blocking v/s non-blocking memory functions, H/W memory management units

Reference Books:
1. Ajay V Deshmukh, Microcontrollers: theory and applications, TMH. New Delhi, 2006
ELE- 23 Analog and Digital System Design

Unit I
Zener series and shunt regulators, transistors as series and shunt regulators, regulator design with discrete components and IC 741/78xx, current sources and their design with discrete components and ICs, SMPS design.

Unit II
Design of multivibrators, (AMV, MMV, BMV) using ICs (555, 741), schmitt trigger, triangular waveform generator, design of oscillators (wein bridge, phase shift colpitt, harlley) using 741, PLL IC LM565, VCO LM566, analog multiplexer IC4051/52, design of RF tuned amplifier,

Unit III
CMOS-TTL and TTL-CMOS interfaces, design of counter using FF and counter ICs, Oscillator design using Schmitt trigger (7414), inverter and NAND gate, MMV using gates and ICs (74/54121, 74221), design of binary to gray code converter, design of BCD to excess-3, excess-3 to BCD converter, design of full adder using MUX, design of 16-1 using 4 4-1 MUXs, design of parity checker, memory interfacing, RAM ROM andEEPROM

Unit IV
Design of ON OFF, proportional and PID controller, design of capacitance and inductance meter, design of DVM using 7107, design of frequency synthesizer, design of digital multimeter.

Reference Books:
1. Introduction to system design using ICs- B.S. Sonde, Wiley Western Ltd.
2. Circuit Consultants Handbook , Hemmnigway
3. Microprocessor and Microcontroller – BPB handbook
4. Digital Fundamentals, Floyd, USB, New Delhi
5. Designing with OP-AMP analog and digital ICs, S.Francio, McGraw Hill.
6. Application and Design with analog ICs, J.Michel Jacob, Printice Hall of India
ELE - 24 Microwave Technology - II

Unit 1: Strip lines and MICs
Microstrip Lines-characteristic impedance, losses, Quality factor Q, Parallel Strip Lines-distributed parameters, characteristic impedance, attenuation losses, Coplanar Strip Lines, Shielded Strip Lines Technology of MMICs-materials, processes involved in fabrication of MMICs, epitaxial growth of semiconductor layer, growth of dielectric layers, diffusion, ion implantation, electron beam technology for pattern delineation
Technology of Hybrid MICs - dielectric substrates, thick film technology and materials, thin film technology and materials, methods of testing, encapsulation, mounting of active devices, Lumped elements for MICs - design of lumped elements, fabrication of lumped elements, circuits using lumped elements, comparison with distributed circuits

Unit 2: Microwave Measurements
Detection of microwave power, Measurement of microwave power - bridge circuit, thermistor parameters, waveguide thermistor mounts, barretters, theory of operation of barretters, direct reading barretter bridges, Measurement of wavelength – single line cavity coupling system, transmission through two line cavity coupling system, Frequency pulling by reactive load, Typical wave meters, measurement of VSWR, measurement of attenuation – Definition of Attenuation, Methods of Measurement

Unit 3: Microwave Antennas
Classification of microwave antennas, General characteristics of microwave antennas, E plane and H plane sectoral horns, Pyramidal horn, methods of analyzing reflector operation, design of paraboloid of revolution by aperture method, exciters for paraboloids of revolution, Casegrain Reflectors

Unit 4: Radar and Radio Aids to Navigation

Reference Books:
ELE- 25 Signals and Systems

Unit 1: Introduction
Introduction to signals, Classification of signals, Elementary signals, Signal operations, Signal implementation with MATLAB, Introduction to systems, Examples of systems, Classification of systems.

Unit 2: Continuous-time systems

Unit 3: Fourier & Laplace Transforms and CT System

Unit 4: Case Studies
Continuous-time filters, Filter classification, Non-ideal filter characteristics, Design of CT low pass filters, Frequency transformations, Case studies for CT systems: Amplitude modulation of baseband signals, Mechanical spring damper system, Armature-controlled dc motor.

Reference Books:
SEM III

ELE- 31 Computer Networking

Unit 1: Unix Operating System:
Introduction, applications Unix Shell, Kernel and Application layer, file system features and benefits, File Management in utilities: pwd, cd, ls, cat, mv, ln, rm, rmdir, find, cut and paste etc., Internal file structure, Directory and directories used by Unix system, The Shell: Shell commands, I/O redirection, pipes and filters, pipe fitting, wildcard, matching background processing, shell script shell variables, shell as programming language, Unix vi editor.

Unit 2: Computer Networking:
LAN, Cabling and Topologies: Various transmission media, Twisted and untwisted pairs, coaxial cables, fiber-optic cables and characteristics, wireless LAN, Cabling Topologies: hierarchical, bus, ring, star, collapsed star, mesh. Origin and definition of LAN, types and uses of LAN, LAN components: NIC N/W cables, hubs, and OS, LAN types: MAP, ARCnet, Apple Talk etc., MAN and WAN, repeaters, Bridges, Routers, Gateways, Backbones etc.

Unit 3: The O.S.I. reference model:
N/W architecture, OSI reference model, data transmission, FDM, TDM, circuit switching, message switching, packet switching, hybrid switching, LAN static and dynamic channel allocation, LAN protocols, IEEE standard 802 for LAN, comprises of LAN’s, The Internet: Introduction, Architecture,

Unit 4: Internet addresses:

Reference Books:
1. Unix for you – Pramod Koparkar, Tata McGraw Hill
2. Unix utilities – R. S. Tare, McGraw Hill.
6. Computer Networks, Andrew S. Tanenbaum, PHI.
Unit 1: Discrete Time Signals and Systems:

Unit 2: Z Transform and Analysis of Discrete Time System

Unit 3: Design and Realization of Digital Filters

Unit 4: DSP Architecture:
Architectural features of DSP processors: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSP, Multiple access memory, Multiport Memory, Pipelining, Special addressing modes, On-chip Peripherals. Different generation of DSP Processors, Fixed point and floating point numeric representation and Arithmetic, Introducing the TI 6000 platform, Features of TMS320C62X Processors, EDMA, Port Interface, External Memory Interface (EMIF), Interrupts, Timers, Basic Interfacing Techniques.

Reference Books:
SEM IV
ELE- 41 Mechatronics

Unit 1 : Introducing Mechatronics, Sensors and Transducers, Signal Conditioning, Digital Signals, Digital Logic

Unit 2 : Pneumatic and Hydraulic Actuation Systems, Mechanical Actuation Systems, Electrical Actuation Systems

Unit 3 : Basic System Model, System Models, Dynamic Responses of System, System Transfer Functions, Frequency Response

Unit 4 : Closed-loop Controllers, Input/Output Systems, Communication Systems, Fault Finding, Mechatronic Systems

Reference Books

UNIT 1. PROCESS CONTROL AND INSTRUMENTATION

Pressure Systems - Pressure measurement Scale, Pressure measurement Instrument, Nonlinear Pressure Sensors, Electronic Pressure Sensors. Pressure control System.


Level Control Systems - Method of Measurement, Electronic Sensors. Analytical Instrumentation pH measurement and control, Humidity

UNIT 2 Industrial Process Techniques and Instrumentation

Industrial Process Techniques - Batch Process, Continuous Process, Measurement Devices(Sensors), Controllers, Monitoring Instruments, Instrumentation Symbology. Process Control Methods: - Open loop Control, Closed loop control, single variable control loop, selecting a controller, on-off control, continuous control, tuning the controller

UNIT 3 Industrial Detection Sensors and Interfacing

Limit Switches, Proximity detectors, Inductive proximity switches, capacitive proximity switches, Hall Effect sensors, photoelectric sensors, method of detection, photoelectric package style, operating specifications, ultrasonic sensors, Sensor Interfacing.

PROGRAMMABLE CONTROLLERS

Introduction to Programmable Controllers – Industrial motor control circuits, Relay ladder logic circuits, Building a ladder diagram, Motor control starter circuit, PLC programming unit, Input output selection, processor unit, Addressing, relation of data file address and I/O modules. Fundamental PLC Programming.

UNIT 4: - INTELLIGENT CONTROL

Genetic Algorithm: Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters. Fuzzy Logic - Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Fuzzification, inference and defuzzification. Fuzzy knowledge and rule bases.

Fuzzy logic & Neural network applications to Drives –

Fuzzy logic applications: - Design of Fuzzy PI controller for speed control of DC motor
Neural network applications: - PWM Controller-Selected harmonic elimination PWM-Space vector PWM-Vector controlled drive-feedback signal estimation-speed estimation and flux estimation of induction motor

Reference Books:

1. Industrial Electronics - Circuits, Instruments and Control techniques, Terry Bartelt, Cengage Learning.
SEM III
Embedded System
ELE 33 FPGA Based System Design

UNIT 1.
Introduction, Manufacturing Processes, Transistor Characteristics, CMOS Logic Gates, wires, Registers and RAM, Packages and Pads, Summary

UNIT 2. FPGA Fabrics.
Introduction, FPGA Architectures, SRAM-Based FPGAs, Permanently Programmed FPGAs, Chip I/O, Circuit Design of FPGA Fabrics, Architecture of FPGA Fabrics, Summary.

UNIT 3. Combinational Logic.

UNIT 4. Sequential Machines.

Architecture.

Reference Books:
1. FPGA based System design by Wayne Wolf
2. Digital Systems Design With FPGAs And CPLDs By Ian Grout, Elsevier(2008)
SEM III
Embedded System

ELE 34 Microcontroller Based System Design and ARM Architecture

Unit 1:
Review of microcontroller solutions for control/measurement systems, their analog and digital features (8051, PIC, AVR, MSP430): architectural benefits, Key characteristics, Digital I/O, interrupts, timer/counters, RTC, analog comparator, ADC, PWM, UART, I2C, clock oscillators, low power operating modes, watchdog timer, ISP/IAP techniques.

Unit 2:
System Design:
Minimum system with 89C51/PIC microcontrollers to monitor frequency, voltage, displacement, liquid level, weight, speed, traffic light control system with software development for above.
Isolation Techniques:
Relays, opto-couplers and their specifications, Interfacing of Relays and opto-couplers with microcontrollers, isolation methods for heavy and a.c. loads.
Signal Transmission:
V to I and I to V Conversion, V to F and F to V Conversion, Electrostatic Shielding and Grounding.

Unit 3:
Transducers and digital sensors for temperature, pressure and speed, signal conditioning, Instrumentation Amplifiers for RTD, thermocouple, bridge and LVDT, System design with 89C51 for measurement and control of temperature, pressure, speed using ON/OFF, Proportional and PID modes, stability aspects of the system, s/w development.

Unit 4:
ARM Architecture:
Introduction to ARM microprocessor and its features, Architecture, Programming model, Processor Operating States, registers, Exceptions, ARM organization – 3-stage/5-stage pipelined ARM organization.
Reference Books:

1. Datasheets of 8051 (P89C51RD2), AVR (ATMEGA32), PIC (16F877), TI MSP430 microcontrollers.
3. Microcontrollers: theory and applications By Ajay V Deshmukh, TMH.
SEM III
Communication

ELE 33 Digital Communications

Unit 1:
Signals Analysis:
Complex Fourier spectrum, Fourier transform, Properties of F.T, sampling theorem, random signals and noise, correlation and power spectrum.

Unit 2:
Digital Communication Systems:
A/D and D/A converter, Coded communication, AM, PWM, PPM, PCM, delta modulation, adaptive delta modulation, quantization and noise consideration.

Digital Transmission and Reception: Timing, base band systems, ASK, FSK, PSK, QAM.

Unit 3:
Error detection and coding:
Parity check, CRC, Hamming distance, Hamming codes, Cyclic codes, line synchronization codes, Manchester code, NRZ coding, Walsh codes.

Unit 4:
Case studies:
Paging system, cellular telephone, global positioning satellite, Facsimile, Videotext.

Reference Books:
SEM III
Communication
ELE 34 Satellite Communications

Unit 1: Satellite Systems
History of satellite communications, Orbital mechanics, Look angle determination, Orbital perturbations, Satellite subsystems – AOCS, TTC and M, power systems, communications subsystems, satellite antennas, Satellite frequency bands, satellite Multiple access formats

Unit 2: Modulation, Encoding and Decoding
Analog modulation, Digital Encoding, Spectral shaping, Digital decoding, Error correction Encoding, Block Waveform Encoding, Digital Throughput.

The Satellite Channel
Electromagnetic field propagation, Antennas, Atmospheric losses, receiver Noise, Carrier to Noise ratios, satellite link analysis, Frequency Reuse by dual polarization, Spot beams in satellite downlinks.

Unit 3: The Satellite Transponder
The transponder model, the satellite front end, RF filtering of digital carriers, Satellite signal processing, Transponder Limiting, Non linear satellite amplifiers, Effect of non linear amplification on digital carriers.

Satellite Ranging System
Ranging system, Component Range Codes, Tone Ranging Systems

Unit 4: Multiple access formats
FDMA - FDMA system, Nonlinear amplification with multiple FDMA Carriers, FDMA, FDMA Nonlinear analysis, FDMA characterization, AM/PM conversion with FDMA, Satellite switched FDMA.

TDMA - The TDMA system, preamble design, Satellite Effects on TDMA performance, Network synchronization, SS TDMA.

CDMA - Direct Sequence CDMA system, Performance of DS CDMA, satellite systems, Frequency Hopped CDMA, Antijam advantages of spectral spreading, Code Acquisition and Tracking

Reference Books
SEM III

Power Electronics

ELE 33 Microcontroller Based System Design and ARM Architecture

Unit 1:
Review of microcontroller solutions for control/measurement systems, their analog and digital features (8051, PIC, AVR, MSP430): architectural benefits, Key characteristics, Digital I/O, interrupts, timer/counters, RTC, analog comparator, ADC, PWM, UART, I2C, clock oscillators, low power operating modes, watchdog timer, ISP/IAP techniques.

Unit 2:
System Design: Minimum system with 89C51/PIC microcontrollers to monitor frequency.
Isolation Techniques: Relays, opto-couplers and their specifications, Interfacing of Relays and opto-couplers
Signal Transmission: V to I and I to V Conversion, V to F and F to V Conversion, Electrostatic

Unit 3:
Transducers and digital sensors for temperature, pressure and speed, signal conditioning, Instrumentation Amplifiers for RTD, thermocouple, bridge and LVDT, System design with 89C51 for measurement and control of temperature, pressure, speed using ON/OFF, Proportional and PID modes, stability aspects of the system, s/w development.

Unit 4:
ARM Architecture: Introduction to ARM microprocessor and its features, Architecture, Programming model, Processor Operating States, registers, Exceptions, ARM organization – 3-stage/5-stage pipelined ARM organization.

Reference Books:

1. Datasheets of 8051 (P89C51RD2), AVR (ATMEGA32), PIC (16F877), TI MSP430 microcontrollers.
3. Microcontrollers: theory and applications By Ajay V Deshmukh, TMH.
SEM III
Power Electronics
ELE-34 Industrial Automation

Unit 1. Process Models:-
Static model dynamic models, Step response methods- two parameter model, three parameter model &
four parameter model. Models for oscillatory system, method of moments. Disturbance models-
measuring noise characteristics.

Controller Principles :- Process Characteristics - process equation, process load, process lag, self
regulation Control system parameters- Error, variable range, control parameter range, control lag, dead
time, cycling.

Unit 2. Tuning of Controllers :-
Control modes: - Discontinuous- two position, multi position, floating control Continuos – proportional,
integral, derivative & composite modes Control paradigms- Cascade control., Criteria for controller
tuning-specified decay ratio, minimum integral of absolute error (IAE), minimum integral of time &
absolute error. (ITAE) closed loop response methods: ultimate method damped oscillation method
Process reaction curve & open loop tuning.

UNIT 3: - Programmable Controllers and SCADA
PLC system, I/O modules and interfacing, CPU processor, programming equipment, programming
formats, construction of PLC ladder diagrams, devices connected to I/O modules.
PLC Programming. Ladder diagrams for process control: Ladder diagrams and sequence listings, ladder
diagram construction and flow chart for spray process system.
PLC Registers
SCADA - Supervisory control and Data Acquisition systems implementation considerations, energy
control centres, software requirements for implementing the above functions.

Unit 4. Digital Controller design:
Controller Design techniques, Bode diagram method, PID controller, Root Locus Method – Root locus
Plot, Controller design, State Space Method – Controllability Observability , Full-state feedback
Regulators Tracker, Regulator design by pole placement, Controlling Voltage, Controlling Current,
Control of Induction Motor
Reference book:


SEM III
Computer Applications
ELE - 33 Soft Computing

Unit 1: Introduction
What is soft computing? Definitions, Goals, Components of soft computing, Importance, Applications of soft computing.

Unit 2: Fuzzy Logic

Unit 3: Artificial Neural Network
Biological Model, Information flow in neural cell, Artificial Neuron, Functions, Equations, Elements, Single and Multilayer Perceptrons, ART, Training and Learning Methods, Associative Memory.

Unit 4: Genetic Algorithm

Reference Books
SEM III
Computer Applications
ELE-34 Advances in Software Design

UNIT 1. Introduction to Software Engineering

UNIT 2. Design Engineering & Software Development Methodologies

UNIT 3. Software Management & Development
Verification and Validation, Software Testing, Critical Systems Validation, Managing People, Software Cost Estimation, Quality Management, Process Improvement, Configuration Management

UNIT 4. Alternative Paradigms

Reference Books:
SEM IV  
**Embedded System**

**ELE 43 ARM Programming and Embedded Communication Protocols**

**Unit 1)**  
The ARM instruction set: Introduction, exceptions, conditional execution, Branch and branch with link, software interrupt, data processing instructions, multiply instructions, data transfer instructions. Architectural support for HLLs: Data types, Expressions, Conditional statements, loops.

**Embedded Communication Protocols:**

**Unit 2)**  
Inter-Integrated Circuit (I2C) BUS: I2C bus specification, general characteristics, bus signals, Address mechanism, Applications – microcontroller interfacing examples for I2C EEPROM, RTC, ADC, and digital temperature sensors.

**Unit 3)**  
Serial peripheral interface (SPI): Introduction, Specifications, master slave configuration, applications - microcontroller interfacing examples for SPI EEPROM, RTC, ADC and digital temperature sensors.

**Unit 4)** Recent embedded protocols:  

**Reference books:**

4. PIC/AVR datasheets for I^2^C, SPI functions.
SEM IV
Embedded System

ELE 44 System Design using EDA Tools

1. FPGA Architecture
   Introduction to Programmable logic, Basic Components of FPGA (LUT, CLB, Switch Matrix, IOB), Basic FPGA Architecture - Spartan 3e/6, Basics of Configuration (Configuration Process, Modes, Configuration Pins & Startup Sequence), Daisy chaining

2. FPGA Design Flow
   Xilinx tool Flow – webpack, Reading Reports, Implementing IP cores – Core Generator, Pin Planning - Plan Ahead, Static timing Analysis, Global timing Constraints, Debugging - Chipscope Pro

3. Optimal FPGA Design:
   Synchronous Design Techniques, HDL Coding Techniques, FPGA Design Techniques, Synthesis Techniques & Implementation Options, Achieving Timing Closure, Identify the differences between behavioral and structural coding styles Distinguish coding for synthesis versus coding for simulation Use scalar and composite data types to represent information Use concurrent and sequential control structure to regulate information flow Implement common VHDL constructs (Finite State Machines [FSMs], RAM/ROM data structures)

4. Hardware Software co-design Methodology

Reference Books:
1. FPGA based System design by Wayne Wolf
2. Digital Systems Design With FPGAs And CPLDs By Ian Grout, Elsevier(2008)
SEM IV
Communication

ELE-43 Fiber Optics Communications

Unit 1:
Introduction: Historical developments, Optical fiber communication system, Principle of optical communication, Advantages of optical fiber communication, Total internal reflection, Acceptance angle, Numerical aperture, Skew rays, Cylindrical fiber.
Structure and types of optical cable: Structure of optical fibers, Single and multimode fibers, Step index and graded index optical fiber.

Unit 2:
Transmission characteristics of optical fibers: Mid-infrared and Far-infrared transmission, Inter-modal and Intra-modal dispersion, Overall fiber dispersion, Polarization.
Losses in optical fibers: Attenuation, Material absorption losses, Linear scattering losses, Non-linear scattering losses and Fiber bends loss and Joint loss.
Preparation methods of optical fibers: Liquid phase (melting) and Vapour phase deposition techniques.

Unit 3:
Optical fiber connection: Joints, Fiber alignment, Splices, Connectors, Couplers.
Optical sources: Absorption and emission of radiation, Einstein's relation, Population inversion, Optical emission from semiconductors, Semiconductor LASER, LED power and efficiency characteristics. Optical transmitter and receiver.

Unit 4:
Optical detectors: Optical detection principles, Absorption and emission, Quantum efficiency, Responsivity, Long wavelength cutoff, p-n photodiode, p-i-n photo diode, photo transistors.
Optical fiber measurements: Fiber attenuation measurements, Dispersion measurements, Refractive index profile measurements, Cut-off wavelength measurements, Numerical aperture measurements.

Reference books:
1. John M. Senior: Optical fiber communications, Principles and Practice, PHI.
4. J. Gower: Optical fiber communication, PHI.
5. Franz and Jain: Optical communications: components and systems; Narosa Publishing House.
SEM IV
Communication
ELE-44 Cellular Mobile Communications

Unit 1: Introduction to Cellular mobile systems, Elements of Cellular radio system Design, specifications of analog systems, Cell coverage for signal and traffic

Unit 2: Cell-site antennas and mobile antennas, Co-channel interference reduction, Types of non co-channel interference, Frequency management and channel assignment

Unit 3: Handoffs and dropped calls, operational techniques and Technologies, switching and traffic

Unit 4: Introduction to digital systems, Digital cellular systems, Intelligent cell construction and Applications, Features of handset, SMS, Security

Reference Books
SEM IV
Power Electronics
ELE 43 Power Electronics Circuit Analysis & System Design

Unit I: Power Electronics Circuit Analysis
I) AC – DC Converter II ) DC to DC Converter III) DC to AC Converter

Unit II: Triggering Circuit Design
Design & tripping circuits for AC to DC Converter, DC to DC converter & DC to AC Converter. Magnetic concepts, design & line frequency and high frequency inductor and transformer. Design & Pulse transformer, General notes on magnetism.

Unit III: Design of AC to DC and AC to AC Converter
Half converter, Full Converter, Bridge Converter and AC to AC Converter with discrete firing circuits and microcontroller based firing circuits.

Unit IV: Design of DC to DC and DC to AC Converter
Design Thyristor, MOSFET and IGBT based chopper with conventional and microcontroller based control circuit. Design and thyristor based inverter and UPS with conventional control circuits and microcontroller based circuits.

Reference Books:
2. M.A. Pai, Power Circuits and Electromechanics, Narosa
3. M.S. Jamil Asghar, Power Electronics, New Delhi : PHI
4. Muhammad H. Rashid, Power Electronics circuits, devices, and applications, Pearson Education
5. Vedam Subrahmanyam, Power Electronics, NEW AGE Publication
SEM IV

Power Electronics

ELE 44 - ADVANCED DRIVES AND CONTROLS

Unit 1: Basic of Electrical machines:-
D.C. motors, Types of D.C. motors, torque speed characteristics. Induction motors, Types of Induction motors. Synchronous machines and stepper motors.

Unit 2: D.C. Motor Control:-
Separately excited DC motors with rectified single phase supply- single phase semi converter and single phase full converter for continuous and discontinuous modes of operation. Three phase semi converter and three phase full converter for continuous and discontinuous modes of operation. Closed loop control of phase controlled DC motor Drives: - Open loop Transfer function of DC Motor drive- Closed loop Transfer function of DC Motor drive –Phase-Locked loop control.
Chopper controlled DC motor drives, Closed loop control of chopper fed DC motor Drives :-
Speed controlled drive system – current control loop – pulse width modulated current controller – hysteresis current controller

Unit 3: AC motor Control:
Voltage Source Inverter Fed Induction motor drives : - Scalar control- Voltage fed Inverter control-Open loop volts/Hz control-Speed control with slip regulation-Speed control with torque and Flux control-Current controlled voltage fed Inverter Drive. Current Source Inverter Fed Induction motor drives : -

Unit 4: Stepper motors:-
Classification, types, modes of excitations, Drive requirements, Unipolar voltage ,drive for various reluctance, motor bipolar voltage drive for permanent magnet and hybrid step motors. Drives for specific applications: - Drive considerations for textile mills, steel rolling mills, cranes and hoist drives, cement mills, sugar mills, paper mills, coal mills, centrifugal pumps.
Reference Books:

1. Electronic drives- Concept & Applications – Vedam Subrahmanyam (THM)
4. Power Electronics – C.W. Lander (MHI Publication)
SEM IV
Computer Applications
ELE 43 Computer Algorithms

Unit 1.
Notation, functions and related theorems. The logarithmic function, Sets, permutations and combinations, Probability, Algorithms: Eciency, analysis and order. Efficient algorithms, Analysis of algorithms, Order, Solving recurrence relations, Induction, characteristic equations, and substitution methods, Extending results

UNIT 2. Divide-and-Conquer
Definition, Applications: Binary search, merge sort, quicksort, More applications: Matrix Multiplication, Arithmetic with large numbers, Determining thresholds

UNIT 3. Dynamic programming - Definition, binomial coefficient
Applications: Shortest path, optimization problems, matrix multiplication
More applications: Binary search trees, traveling salesperson problem

UNIT 4. The greedy approach: Definition, Applications: Minimum spanning tree, shortest path, scheduling Greedy vs. dynamic programming; Backtracking: Definition, Applications: the n-queens, sum-of-subsets, graph coloring, More applications: Hamiltonian circuit, 0-1 knapsack.

Reference books:
SEM IV

Computer Applications

ELE 44 Advanced Computer Networking

UNIT 1
Introduction: Internet Architecture, End-to-End principle and Internet design, Emerging Data Link and Physical Layer Technologies Applications: HTTP, FTP, DNS, SMTP, Overlay Networks and Peer-to-Peer (P2P), Systems, P2P File Sharing

UNIT 2
Transport: Transport Services, TCP and UDP, IP Routing: IP Addressing, Overview of Internet Protocols (e.g. IP, ICMP), Distance Vector, Link-State (OSPF), BGP, Multicast routing. Link Layer and Local Area Networks The Data Link Layer: Introduction, Services, Error Detection and Correction Techniques, Multiple Access Protocols and LANs, LAN Addresses and AR, Ethernet, Hubs, Bridges, and Switches, IEEE 802.11 LANs, PPP: The Point-to-Point Protocol, Asynchronous Transfer Mode (ATM), X.25 and Frame Relay.

UNIT 3

Unit 4

Reference Books:

2. DATA COMMUNICATIONS AND NETWORKING, Behrouz A. Forouzan, McGraw-Hill.
5. Computer Networks, Andrew S. Tanenbaum, PHI.