UNIVERSITY OF KERALA

B.TECH DEGREE COURSE
(2008 SCHEME)

REGULATIONS, SCHEME AND SYLLABUS
FOR

APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING
UNIVERSITY OF KERALA
B.Tech Degree Course – 2008 Scheme
REGULATIONS

1. Conditions for Admission

Candidates for admission to the B.Tech degree course shall be required to have passed the Higher Secondary Examination, Kerala or 12th Standard V.H.S.E., C.B.S.E., I.S.C. or any examination accepted by the university as equivalent thereto obtaining not less than 50% in Mathematics and 50% in Mathematics, Physics and Chemistry/ Bio-technology/ Computer Science/ Biology put together, or a diploma in Engineering awarded by the Board of Technical Education, Kerala or an examination recognized as equivalent thereto after undergoing an institutional course of at least three years securing a minimum of 50% marks in the final diploma examination subject to the usual concessions allowed for backward classes and other communities as specified from time to time.

2. Duration of the Course

i) The course for the B.Tech Degree shall extend over a period of four academic years comprising of eight semesters. The first and second semesters shall be combined and each semester from third semester onwards shall cover the groups of subjects as given in the curriculum and scheme of examination

ii) Each semester shall ordinarily comprise of not less than 400 working periods each of 60 minutes duration

iii) A candidate who could not complete the programme and pass all examinations within Ten (10) years since his first admission to the B.Tech programme will not be allowed to continue and he has to quit the Programme. However, he can be readmitted to the first year of the programme if he/she satisfies the eligibility norms applicable to the regular candidates prevailing at the time of readmission.

3. Eligibility for the Degree

Candidates for admission to the degree of bachelor of technology shall be required to have undergone the prescribed course of study in an institution maintained by or affiliated to the University of Kerala for a period of not less than four academic years and to have passed all the examinations specified in the scheme of study

4. Subjects of Study

The subjects of study shall be in accordance with the scheme and syllabi prescribed

5. Evaluation

Candidates in each semester will be evaluated both by continuous assessment and end semester University examination. The individual maximum marks allotted for continuous assessment and University examination for each subject is as prescribed by the scheme of study.

5.1 Continuous Assessment (C.A)

The marks awarded for the continuous assessment will be on the basis of the day-to-day work, periodic tests (minimum two in a semester) and assignments (minimum of three – one each from each module). The faculty member concerned will do the continuous assessment for each semester. The C.A. marks for the individual subjects shall be computed by giving weight age to the following parameters.
<table>
<thead>
<tr>
<th>Subject</th>
<th>Attendance</th>
<th>Tests</th>
<th>Assignments/Class Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory Subjects</td>
<td>20%</td>
<td>50%</td>
<td>30%</td>
</tr>
<tr>
<td>Drawing</td>
<td>20%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Practical</td>
<td>20%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>Project Work</td>
<td>Work Assessed by Guide – 50%</td>
<td>Assessed by a three member committee out of which one member is the guide – 50%</td>
<td></td>
</tr>
</tbody>
</table>

The C.A. marks for the attendance (20%) for each theory, practical and drawing shall be awarded in full only if the candidate has secured 90% attendance or above in the subject. Proportionate reduction shall be made in the case of subjects in which he/she gets below 90% of the attendance for a subject. The CA marks obtained by the student for all subjects in a semester is to be published at least 5 days before the commencement of the University examinations. Anomalies if any may be scrutinized by the department committee and the final CA marks are forwarded to the university within the stipulated time.

5.2. End Semester University Examinations

i) There will be University examinations at the end of the first academic year and at the end of every semester from third semester onwards in subjects as prescribed under the respective scheme of examinations. Semester classes shall be completed at least 10 working days before the commencement of the University examination.

ii) The examination will be held twice in a year – April/May session (for even semester) and October/November session (for odd semester). The combined 1st and 2nd semester is reckoned as equivalent to an even semester for the purpose of conduct of examination and the University examination will be held during April/May. However VII and VIII Semester examination will be conducted in both the sessions. This schedule will not be changed.

iii) A student will be permitted to appear for the university examination only if he/she satisfies the following requirements

a. He/she must secure not less than 75% attendance in the total number of working periods during the first year and in each semester thereafter and shall be physically present for a minimum of 60% of the total working periods. In addition, he/she also shall be physically present in at least 50% of total working periods for each subject.
b. He must earn a progress certificate from the head of the institution of having satisfactorily completed the course of study in the semester as prescribed by these regulations.
c. It shall be open to the Vice-Chancellor to grant condonation of shortage of attendance on the recommendation of the head of the institution in accordance with the following norms.
d. The attendance shall not be less than 60% of the total working periods.
e. He/she shall be physically present for a minimum of 50% of the total working periods.
f. The shortage shall not be condoned more than twice during the entire course.
g. The condonation shall be granted subject to the rules and procedures prescribed by the university from time to time.
h. The condonation for combined 1st and 2nd semesters will be reckoned as a single condonation for attendance purposes.

iv) A student who is not permitted to appear for the University examinations for a particular semester due to the shortage of attendance and not permitted by the authorities for condonation of shortage of attendance shall repeat the semester when it is offered again. This provision is allowed only once for a semester.

v) The university will conduct examinations for all subjects (Theory, Drawing & Practical)
vi) The scheme of valuation will be decided by the chief examiner for theory / drawing subjects

vii) For practical examinations, the examiners together will decide the marks to be awarded. The student shall produce the certified record of the work done in the laboratory during the examination. The evaluation of the candidate should be as per the guidelines given in the syllabus for the practical subject.

6. Letter Grades

For each subject in a semester, based on the total marks obtained by the student in the University examination and Continuous assessment put together a letter grade (S, A+, A, B+, B, C+, C, D, E and F) will be awarded. **All letter grades except ‘F’ will be awarded if the marks for the University examination is 40 % or above and the total mark (C.A marks + University Exam mark) is 50 % or above.** No absolute mark will be indicated in the grade card. Letter grade corresponding to total marks (C.A marks + University Exam mark) and the corresponding grade point in a ten-point scale is described below.

<table>
<thead>
<tr>
<th>% of Total marks</th>
<th>Letter Grade</th>
<th>Grade Point (G.P)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 % and above</td>
<td>S</td>
<td>10</td>
<td>Excellent</td>
</tr>
<tr>
<td>85 % and above but less than 90%</td>
<td>A+</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>80 % and above but less than 85%</td>
<td>A</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>75 % and above but less than 80%</td>
<td>B+</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>70 % and above but less than 75%</td>
<td>B</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>65 % and above but less than 70%</td>
<td>C+</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>60 % and above but less than 65%</td>
<td>C</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>55 % and above but less than 60%</td>
<td>D</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>50 % and above but less than 55%</td>
<td>E</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>Below 50% (C.A + U.E) or below 40 % for U.E only</td>
<td>F</td>
<td>0</td>
<td>Failed</td>
</tr>
</tbody>
</table>

7. Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA)

Grade point average is the semester wise average points obtained by each student in a 10-point scale. GPA for a particular semester is calculated as per the calculation shown below.

\[
GPA = \frac{\sum Credit \times GP \text{ obtained for the subject}}{\sum credit \text{ for subject}}
\]

Cumulative Grade point Average (CGPA) is the average grade points obtained by the students till the end of any particular semester. CGPA is calculated in a 10-point scale as shown below.

\[
CGPA = \frac{\sum \text{Credits for semester} \times GPA \text{ obtained for the semester}}{\sum \text{credits for the semester}}
\]

GPA and CGPA shall be rounded to two decimal points. The Grade card issued to the students shall contain subject number and subject name, credits for the subject, letter grades obtained, GPA for the semester and CGPA up to that particular semester. In addition to the grade cards for each semester all successful candidate shall also be issued a consolidated statement grades. On specific request from a candidate and after remitting the prescribed fees the University shall issue detailed mark to the individual candidate.

8. Minimum for a pass
a) A candidate shall be declared to have passed a semester examination in full in the first appearance if he/she secures not less than 5.5 GPA with a minimum of ‘E’ grade for the all individual subject in that semester.
b) A candidate shall be declared to have passed in an individual subject of a semester examination if he/she secures grade ‘E’ or above.
c) A candidate who does not secure a full pass in a semester examination as per clause (a) above will have to pass in all the subjects of the semester examination as per clause (b) above before he is declared to have passed in that semester examination in full.

9. Improvement of Grades

i) A candidate shall be allowed to re-appear for a maximum of two subjects of a semester examination in order to improve the marks and hence the grades already obtained subject to the following conditions

a) The candidate shall be permitted to improve the examination only along with next available chance.
b) The candidate shall not be allowed to appear for an improvement examination for the subjects of the VII & VIII semesters
c) The grades obtained by the candidate for each subject in the improvement chance he has appeared for or the already existing grades – whichever is better will be reckoned as the grades secured.
d) First & Second semester will be counted as a single chance and they can improve a maximum of three subjects

ii) A candidate shall be allowed to repeat the course work in one or more semesters in order to better the C.A. marks already obtained, subject to the following conditions

a) He/she shall repeat the course work in a particular semester only once and that too at the earliest opportunity offered to him/her.
b) He/she shall not combine this course work with his/her regular course work
c) He/she shall not be allowed to repeat the course work of any semester if he has already passed that semester examination in full
d) The C.A marks obtained by the repetition of the course work will be considered for all purposes

iii) A candidate shall be allowed to withdraw from the whole examination of a semester in accordance with the rules for cancellation of examination of the University of Kerala.

10. Classification of Successful candidates

i) A candidate who qualifies for the degree passing all the subjects of the eight semesters within five academic years (ten consecutive semesters after the commencement of his/her course of study) and secures not less than 8 CGPA up to and including eighth semester (overall CGPA) shall be declared to have passed the B.Tech degree examination in FIRST CLASS WITH DISTINCTION

ii) A candidate who qualifies for the degree passing all the subjects of the eight semesters within five academic years (ten consecutive semesters after the commencement of his/her course of study) and secures less than 8 CGPA but not less than 6.5 CGPA up to and including eighth semester shall be declared to have passed the B.Tech degree examination in FIRST CLASS.

iii) All other successful candidates shall be declared to have passed the B.Tech Degree examination in SECOND CLASS

iv) Successful candidates who complete the examination in four academic years (Eight consecutive semesters after the commencement of the course of study shall be ranked branch-wise on the basis of the CGPA in all eight semesters put together. In the case of a tie in the CGPA the total marks of
the students who have got same CGPA shall be considered for finalizing the rank. Students who pass the examination in supplementary examination are also covered under this clause

11. Educational Tour
a) The students may undertake one educational tour preferably after fourth semester of the course and submit a tour report
b) The tour may be conducted during the vacation / holidays taking not more than 5 working days, combined with the vacation / holidays if required. Total number of Tour days shall not exceed 15 days.
c) The tour period shall be considered as part of the working periods of a semester

12. Revision of Regulations
The university may from time to time revise, amend or change the regulations, curriculum, scheme of examinations and syllabi. These changes unless specified otherwise, will have effect from the beginning of the academic year / semester following the notification of the University
### SCHEME FOR B.TECH DEGREE FROM 2008
### APPLIED ELECTRONICS AND INSTRUMENTATION

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name of Subject</th>
<th>Weekly load hrs</th>
<th>Max. Sessional Marks</th>
<th>Exam Duration Hrs</th>
<th>Exam Max. Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.101</td>
<td>Engineering Mathematics I</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>08.102</td>
<td>Engineering Physics</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>08.103</td>
<td>Engineering Chemistry</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>08.104</td>
<td>Engineering Graphics</td>
<td>1 - 2</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>08.105</td>
<td>Engineering Mechanics</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>6</td>
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<tr>
<td>08.106</td>
<td>Basic Civil Engineering</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
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<tr>
<td>08.107</td>
<td>Basic Mechanical Engineering</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>08.108</td>
<td>Basic Electrical &amp; Electronics</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Engineering Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08.109</td>
<td>Basic Communication &amp; Information</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Engineering Workshops</td>
<td>- - 2</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
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<td><strong>TOTAL</strong></td>
<td></td>
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<td>500</td>
<td>1000</td>
<td>58</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL MARKS 1500**  **TOTAL CREDITS 58**

**Note:** 08.109 Subject shall be handled by the faculty of Electronics & Communication Dept.in the Colleges.
### BRANCH: APPLIED ELECTRONICS AND INSTRUMENTATION SEMESTER III

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name of Subject</th>
<th>Weekly load hrs</th>
<th>Max. Sessional Marks</th>
<th>Exam Duration Hrs</th>
<th>Exam Max. Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.301</td>
<td>Engineering Mathematics II (CMPUNERFHBT)</td>
<td>3 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>08.302</td>
<td>Solid State Devices (TA)</td>
<td>3 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>08.303</td>
<td>Network Analysis (TA)</td>
<td>3 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>08.304</td>
<td>Programming in C++ &amp; Data Structures (TA)</td>
<td>2 - 2</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>08.305</td>
<td>Functional Electronics (A)</td>
<td>3 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
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<tr>
<td>08.306</td>
<td>Electrical Machines &amp; Drives (A)</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>3</td>
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<tr>
<td>08.307</td>
<td>Electronics Devices Lab (TA)</td>
<td>- - 3</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>08.308</td>
<td>Electronics Circuits &amp; Simulation Lab (A)</td>
<td>- - 3</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>16 5 8</td>
<td>400</td>
<td>800</td>
<td>29</td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL MARKS 1200**  **TOTAL CREDITS 29**

Note: 08.306 shall be handled by faculty of Electrical & Electronics Dept.  08.304 shall be handled by faculty of Electronics & Communication Dept.

### BRANCH: APPLIED ELECTRONICS AND INSTRUMENTATION SEMESTER IV

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name of Subject</th>
<th>Weekly load hrs</th>
<th>Max. Sessional Marks</th>
<th>Exam Duration Hrs</th>
<th>Exam Max. Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.401</td>
<td>Engineering Mathematics III - Probability &amp; Random Processes (TA)</td>
<td>3 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>08.402</td>
<td>Humanities (CTARFHD) (TA)</td>
<td>3 - -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>08.403</td>
<td>Signals &amp; Systems (TA)</td>
<td>3 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>08.404</td>
<td>Linear Integrated Circuits (A)</td>
<td>3 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>08.405</td>
<td>Digital Circuit Design (A)</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>08.406</td>
<td>Basic Instrumentation (A)</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>08.407</td>
<td>Digital Integrated Circuits &amp; HDL Lab (A)</td>
<td>- - 4</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>08.408</td>
<td>Measurements &amp; Instrumentation Lab (A)</td>
<td>- - 4</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>16 5 8</td>
<td>400</td>
<td>800</td>
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</table>

**TOTAL MARKS 1200**  **TOTAL CREDITS 29**

Note: 08.401 shall be handled by faculty of Mathematics Dept.
<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name of Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.501</td>
<td>Engineering Mathematics IV - Complex Analysis &amp; Linear Algebra (TA)</td>
</tr>
<tr>
<td>08.502</td>
<td>Digital Signal Processing (TA)</td>
</tr>
<tr>
<td>08.503</td>
<td>Computer Organisation &amp; Architecture (TA)</td>
</tr>
<tr>
<td>08.504</td>
<td>Control System Theory (A)</td>
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<tr>
<td>08.505</td>
<td>Power Electronics (A)</td>
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<td></td>
<td>Elective I (TA) or (A)</td>
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<tr>
<td>08.507</td>
<td>Power Electronics Lab (A)</td>
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<tr>
<td>08.508</td>
<td>Electrical Machines &amp; Drives Lab (A)</td>
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<td><strong>TOTAL</strong></td>
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<table>
<thead>
<tr>
<th>Weekly load hrs</th>
<th>Max. Sessional Marks</th>
<th>Exam Duration Hrs</th>
<th>Exam Max. Marks</th>
<th>Credits</th>
</tr>
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<tbody>
<tr>
<td>L   T   D/P</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3    1     -</td>
<td>50</td>
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<td>4</td>
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</tr>
<tr>
<td>15   6     8</td>
<td>400</td>
<td>800</td>
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**TOTAL MARKS 1200**   **TOTAL CREDITS 29**

**Elective I**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name of Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.506</td>
<td>Logic Synthesis &amp; Verification (TA)</td>
</tr>
<tr>
<td>08.516</td>
<td>Fuzzy Systems &amp; Applications (TA)</td>
</tr>
<tr>
<td>08.526</td>
<td>System Software (TA)</td>
</tr>
<tr>
<td>08.536</td>
<td>Artificial Neural Networks (TA)</td>
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<tr>
<td>08.546</td>
<td>Digital Systems Design with VHDL (TA)</td>
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<tr>
<td>08.556</td>
<td>Professional Communication (TA)</td>
</tr>
<tr>
<td>08.566</td>
<td>CMOS Circuits Design (A)</td>
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Note: 08.501 shall be handled by faculty of Mathematics Dept.

08.508 shall be handled by faculty of Electrical & Electronics Dept.
<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name of Subject</th>
<th>Weekly load hrs</th>
<th>Max. Sessional Marks</th>
<th>Exam Duration Hrs</th>
<th>Exam Max. Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>08.601</td>
<td>Microcontroller Based System Design (TA)</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>50</td>
<td>3</td>
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<tr>
<td>08.602</td>
<td>VLSI Design (TA)</td>
<td>3</td>
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<td>08.603</td>
<td>Optical Instrumentation (A)</td>
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<td>08.605</td>
<td>Communication Engineering (A)</td>
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<td>08.607</td>
<td>Elective II (TA) or (A)</td>
<td>2</td>
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<td>08.608</td>
<td>Electronic Product Design &amp; Mini Project (TA)</td>
<td>-</td>
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<td><strong>7</strong></td>
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<td><strong>800</strong></td>
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**TOTAL MARKS 1200**  **TOTAL CREDITS 29**

**Elective II**

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name of Subject</th>
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<tbody>
<tr>
<td>08.606</td>
<td>Speech Processing (TA)</td>
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<tr>
<td>08.616</td>
<td>Adaptive Signal Processing (TA)</td>
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<tr>
<td>08.626</td>
<td>Digital Image Processing (TA)</td>
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<tr>
<td>08.636</td>
<td>Wavelets &amp; Applications (TA)</td>
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<tr>
<td>08.646</td>
<td>Digital Signal Processors (TA)</td>
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<tr>
<td>08.656</td>
<td>Optimization Techniques (TA)</td>
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<td>08.666</td>
<td>Electromagnetics (A)</td>
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<td>Name of Subject</td>
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<tr>
<td>08.701</td>
<td>Industrial Management (TA)</td>
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<tr>
<td>08.702</td>
<td>Robotics &amp; Industrial Automation (A)</td>
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<td>08.703</td>
<td>Discrete-Time Control Systems (A)</td>
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<td>08.704</td>
<td>Process Dynamics &amp; Control (A)</td>
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<td>Elective IV (TA) or (A)</td>
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<tr>
<td>08.707</td>
<td>Biomedical Signal Processing Lab (A)</td>
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<td>08.708</td>
<td>Control system Lab (A)</td>
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<td>08.709</td>
<td>Seminar (TA)</td>
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<td>08.710</td>
<td>Project Design (TA)</td>
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Note: 08.701 shall be handled by faculty of Mechanical Dept.

<table>
<thead>
<tr>
<th>Elective III</th>
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<tbody>
<tr>
<td>08.705</td>
<td>Real Time Operating Systems (TA)</td>
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<td>08.715</td>
<td>Cryptography (TA)</td>
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<tr>
<td>08.725</td>
<td>Pattern Recognition (TA)</td>
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<td>08.735</td>
<td>Optoelectronic Devices (TA)</td>
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<td>08.745</td>
<td>Computer Vision (TA)</td>
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<td>Biomedical Imaging Techniques (A)</td>
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<td>08.706</td>
<td>Mixed Signal Circuits Design (TA)</td>
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<td>08.716</td>
<td>Embedded Systems (TA)</td>
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<td>Intellectual Property Rights (TA)</td>
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<td>MEMS (TA)</td>
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<td>08.746</td>
<td>Low Power VLSI Design (TA)</td>
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<td>08.756</td>
<td>Mechatronics (A)</td>
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### BRANCH: APPLIED ELECTRONICS AND INSTRUMENTATION SEMESTER VIII

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Name of Subject</th>
<th>Weekly load hrs</th>
<th>Max. Sessional Marks</th>
<th>Exam Duration Hrs</th>
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<td>08.801</td>
<td>Nano Electronics (TA)</td>
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<td>08.802</td>
<td>Non Linear Control Theory (A)</td>
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<td>Smart Sensors &amp; Networks (A)</td>
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<td>08.804</td>
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<td>Elective VI (A)</td>
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**TOTAL MARKS 1300**  **TOTAL CREDITS 29**

#### Elective V
- 08.805 Distributed Control Systems (A)
- 08.815 Adaptive Control Systems (A)
- 08.825 Robust Control (A)
- 08.835 VLSI Structures for Signal Processing (A)
- 08.845 VLSI Device & Process Simulation (A)

#### Elective VI
- 08.806 Modelling & Simulation of Dynamic Systems (A)
- 08.816 Reversible Logic Design (A)
- 08.826 Control of Power Convertors (A)
- 08.836 Virtual Instrumentation (A)
- 08.846 Current Topics (A)
Syllabus I & II Semester  
(Common To All Branches)

08.101 ENGINEERING MATHEMATICS- 1

L-T-P : 2-1-0                                           Credits: 6

MODULE- I
Applications of differentiation:– Definition of Hyperbolic functions and their derivatives-
Successive differentiation- Leibnitz’ Theorem(without proof)- Curvature- Radius of curvature- centre 
of curvature- Evolute ( Cartesian ,polar and parametric forms)
Partial differentiation and applications:- Partial derivatives- Euler’s theorem on homogeneous 
functions- Total derivatives- Jacobians- Errors and approximations- Taylor’s series (one and two 
variables) - Maxima and minima of functions of two variables - Lagrange’s method- Leibnitz rule on 
differentiation under integral sign.
Vector differentiation and applications : - Scalar and vector functions- differentiation of vector 
functions-Velocity and acceleration- Scalar and vector fields- Operator ∇ - Gradient- Physical 
interpretation of gradient- Directional derivative- Divergence- Curl- Identities involving ∇ (no proof)  
- Irrotational and solenoidal fields – Scalar potential.

MODULE-II
Laplace transforms:- Transforms of elementary functions - shifting property- Inverse transforms-
Transforms of derivatives and integrals- Transform functions multiplied by t and divided by t - 
Convolution theorem(without proof)-Transforms of unit step function, unit impulse function and 
periodic functions-second shifiting theorem- Solution of ordinary differential equations with constant 
coefficients using Laplace transforms.
Differential Equations and Applications:- Linear differential equations with constant coefficients-
Method of variation of parameters - Cauchy and Legendre equations –Simultaneous linear equations 
with constant coefficients- Application to orthogonal trajectories (cartesian form only).

MODULE-III
Matrices:-Rank of a matrix- Elementary transformations- Equivalent matrices- Inverse of a matrix by 
gauss-Jordan method- Echelon form and normal form- Linear dependence and independence of 
Vectors- Consistency- Solution of a system linear equations-Non homogeneous and homogeneous 
equations- Eigen values and eigen vectors – Properties of eigen values and eigen vectors- Cayley 
Hamilton theorem(no proof)- Diagonalisation- Quadratic forms- Reduction to canonical forms-Nature 
of quadratic forms-Definiteness,rank,signature and index.

REFERENCES
08.102 ENGINEERING PHYSICS

L-T-P: 2-1- 0                  Credits: 6

MODULE-I

Oscillations and Waves
Basic ideas of harmonic oscillations – Differential equation of a SHM and its solution. Theory of
Types of waves. One dimensional waves – Differential Equation. Harmonic waves. Three
dimensional waves - Differential Equation and solution. Plane waves and spherical waves. Energy in
wave motion. Velocity of transverse waves along a stretched string.

Electromagnetic Theory
Del operator – grad, div, curl and their physical significance. Concept of displacement current.
Deduction of Maxwell’s equations. Prediction of electromagnetic waves. Transverse nature of
electromagnetic waves. \( E \) and \( H \) are at right angles. Poynting’s theorem (qualitative only)

Physics of Solids
Space lattice. Unit cell and lattice parameters. Crystal systems. Co-ordination number and packing
factor with reference to simple cubic, body centered cubic and face centered cubic crystals. Directions
and planes. Miller indices. Interplanar spacing in terms of Miller indices. Super conductivity -
Meissner effect. Type-I and Type-II superconductors. BCS theory (qualitative). High temperature
superconductors. Applications of superconductors. Introduction to new materials (qualitative) -
Metallic glasses, Nano materials, Shape memory alloys, Bio materials.

MODULE- II

Interference of Light
Concept of temporal and spatial coherence. Interference in thin films and wedge shaped films.
Newton’s rings. Michelson’s interferometer. Determination of wave length and thickness.
Interference filters. Antireflection coating.

Diffraction of Light
Fresnel and Fraunhofer diffraction. Fraunhofer diffraction at a single slit. Fraunhofer diffraction at a
circular aperture (qualitative). Rayleigh’s criterion for resolution. Resolving power of telescope and
microscope. Plane transmission grating. Resolving power of grating. Grating equation. X-ray
diffraction. Bragg’s law.

Polarization of Light
and elliptically polarized light. Production and analysis of circularly and elliptically polarized light.
Polaroids. Induced birefringence. Photo elasticity – isoclinic and isochromatic fringes – photo elastic
bench

Special Theory of Relativity
Michelson-Morley experiment. Einstein’s postulates. Lorentz transformation equations (no

MODULE – III

Quantum Mechanics
values and functions. Expectation values. Time Dependent and Time Independent Schrodinger
equations. Particle in one dimensional box. Tunnelling (qualitative).

Statistical Mechanics
Macrostates and Microstates. Phase space. Basic postulates of Maxwell-Boltzmann, Bose-Einstein
and Fermi-Dirac statistics. Distribution equations in the three cases (no derivation). Bosons and
Fermi energy.
Laser

REFERENCE:
Sears & Zemansky ; University Physics. XI Edn.; Pearson
Frank & Leno; Introduction to Optics. III Edn., , Pearson
J.C. Upadhyaya; Mechanics., Ram Prasad & Sons
David J Griffiths; Introduction to Electrodynamics, III Edn., , Pearson
M Ali Omar; Elementary Solid State Physics., Pearson
S O Pillai; Solid State Physics., New Age International Publishers
John R Taylor, Chris D Zafiratos & Michael A Dubson; Modern Physics for Scientists and Engineers. II Edn, Prentice Hall of India
Eugene Hecht; Optics. IV Edn, Pearson
Robert Resnick ; Introduction to Special Relativity., John Willey and Sons
Richard L Libboff; Introduction to Quantum Mechanics. IV Edn, Pearson
Donald A Mcquarrie; Statistical Mechanics., Vivo Books
Mark Ratner& Daniel Ratner; Nanotechnology.
T.A. Hassan et al; A Text Book of Engineering Physics., Aswathy Publishers, Trivandrum
B. Premlet; Advanced Engineering Physics , Phasor Books, Kollam.

LIST OF DEMONSTRATION EXPERIMENTS
Newton’s Rings – Determination of wave length.
Air Wedge – Diameter of a thin wire
Spectrometer – Plane transmission grating – wavelength of light.
Spectrometer – Refractive indices of calcite for the ordinary and extraordinary rays.
Laser – Diffraction at a narrow slit.
Laser – Diffraction at a straight wire or circular aperture.
Michelson’s interferometer – Wavelength of light.
Michelson’s interferometer – Thickness of thin transparent film.
Polarization by reflection – Brewster’s law.
Computer stimulation – superposition of waves.
Computer stimulation – study of $E$ & $H$. (Gauss’ law & Ampere’s law)

Pattern of Question Paper
University examination is for a maximum of 100 marks, in 3 hour duration. The syllabus is spread in 3 modules. The question paper will consist of two parts (A and B).

Part A contains short answer questions for 40 marks. This part contains 10 questions without any choice, each of 4 marks (uniformly taken from all modules).

Part B contains long answer questions for 60 marks. From each module, this part contains 3 questions out of which 2 are to be answered, each of 10 marks. Long answer questions from all the 3 modules will form 60 marks.
08.103 ENGINEERING CHEMISTRY
L-T-P: 2-1-0
Credits: 6

MODULE-I
Corrosion and its control- Theories of corrosion (chemical corrosion and electrochemical corrosion)- Galvanic series- Types of corrosion (Concentration cell corrosion, Stress corrosion, Galvanic corrosion) - Factors affecting corrosion (nature of metal and nature of environment) and different methods of corrosion control (corrosion inhibitors, cathodic protection). (5hrs)
Protective coatings- Metallic coatings- Chemical conversion coatings- paint (4hrs)

MODULE-II
Water treatment- Types of hardness- Degree of hardness- Related problems- Estimation of hardness- by EDTA method- Sludge and scales in boilers- Priming and foaming- Boiler corrosion- Water softening methods, Lime-soda process, Ion exchange methods-Internal treatments (colloidal, carbonate, phosphate and calgon conditioning)- Domestic water treatment- Methods of disinfection of water-Desalination process (Reverse osmosis, electro dialysis- Distillation). (12hrs)
Environmental damages and prevention- Air pollution- CFCs and ozone depletion- Alternative refrigerents-Green house effect-Water pollution- BOD and COD- Waste water treatment- Aerobic - Anaerobic and USAB processes. (3hrs)
Thermal methods of analysis- Basic principles involved in Thermo gravimetry, Differential thermal analysis and applications. (2hrs)
Spectroscopy- Molecular energy levels-Types of molecular spectra- Electronic spectra (Classification of electronic transitions- Beer Lamberts law, Vibrational spectra (mechanism of interaction and application), Rotational spectra (Determination of bond length and application). NMR spectra (Basic principle, chemical shift, spin-spin splitting) (6hrs)
Chromatography- General principles- High performance liquid chromatography- Gas chromatography. (2hrs)

MODULE-III
Polymers- Classifications- Mechanism of polymerisation (Addition, free radical, cationic, anionic and coordination polymerisation)- Thermoplastics and thermosetting plastics-Compounding of plastics-Moulding techniques of plastics (Compression, Injection, Transfer and Extrusion moulding)- Preparation, properties and uses of PVC, PVA, PMMA, Nylon, PET, Bakelite, Urea formaldehyde resin- Silicon polymers- Biodegradable plastics. Elastomers- structure of natural rubber-vulcanisation- synthetic rubbers (Buna-S, Butyl rubber and Neoprene) (12hrs)
Organic electronic compounds -Super conducting and conducting organic materials like Polyaniline, polyacetylene and [polypyrrol and its applications. (2hrs)
Fuels- Calorific value- HCV and LCV-Experimental determination of caloric value-Theoretical calculation of caloric value by Dulong's formula - Bio fuels -Bio hydrogen and Bio-diesel (5hrs)
Lubricants- Introduction-Mechanism of lubrication- solid and liquid lubricant- Properties of lubricants-Viscosity index- flash and fire point- cloud and pour point- aniline value. (4hrs)
Cement- Manufacture of Portland cement- Theory of setting and hardening of cement (2hrs)
LAB-EXPERIMENTS (DEMONSTRATION ONLY)

1. Estimation of total hardness in water using EDTA.
2. Estimation of chloride ions in domestic water.
3. Estimation of dissolved oxygen.
4. Estimation of COD in sewage water.
5. Estimation of available chlorine in bleaching powder.
8. Determination of flash and fire point of a lubricating oil by Pensky Marten’s apparatus.
12. Determinations of pH using glass electrode and quinhydrone electrode.

REFERENCES

H.A. Willard, L.L. Merrit and J.A. Dean; *Instrumental methods of analysis*
A.K. De; *Environmental Chemistry*
K.J.Klaehunde; *Nanoscale materials in chemistry*
B.R. Gowariker; *Polymer science*
B.W.Gonser; *Modern materials*
V.Raghavan; *Material Science and engineering. A first course*
L.H. Van Vlack; *Elements of Material science and Engineering*
J.W.Goodby; *Chemistry of liquid crystals*
S.Glasstone; *A text book of physical chemistry*
P.C. Jain; *Engineering Chemistry*
Juhaina Ahad; *Engineering Chemistry*
Shashi Chawla; *A text book of Engineering Chemistry*
R. Gopalan, D.Venkappayya & S. Nagarajan; *Engineering Chemistry*
J.C. Kuriakose and J. Rajaram; *Chemistry of Engineering and Technology volume I & II*
R.N Goyal and Harmendra Goeal; *Engineering Chemistry, Ane Students Edition, Thiruvananthapuram*
INTRODUCTION: Introduction to technical drawing and its language. Lines, lettering, dimensioning, scaling of figures, symbols and drawing instruments. (1 sheet practice)

MODULE I
PLAIN CURVES: Conic sections by eccentricity method. Construction of ellipse: (i) Arc of circles method (ii) Rectangle method (iii) Concentric circles method. Construction of parabola (i) Rectangle method (ii) Tangent method. Construction of hyperbola (i) Arc of circles method (ii) given ordinate, abscissa and the transverse axis (iii) given the asymptotes and a point on the curve. Construction of Tangent and Normal at any point on these curves
MISCELLANEOUS CURVES: Construction of Cycloid, Epicycloid and Hypocycloid, Involute of a circle. Archimedian spiral, Logarithmic spiral and Helix. Construction of Tangent and Normal at any point on these curves
PROJECTING POINTS AND LINES: Types of projections, Principles of Orthographic projection. Projections of points and lines. Determination of true length, inclination with planes of projection and traces of lines.

MODULE II
PROJECTING SOLIDS: Projection of simple solids such as prisms, pyramids, cone, cylinder, tetrahedron, octahedron, sphere and their auxiliary projections.
SECTIONS OF SOLIDS: Types of cutting planes, section of simple solids cut by parallel, perpendicular and inclined cutting planes. Their projections and true shape of cut sections.
DEVELOPMENT OF SURFACES: Development of surfaces of (i) simple solids like prisms, pyramids, cylinder and cone (ii) Cut regular solids.

MODULE III
ISOMETRIC PROJECTION: Isometric scale, Isometric view and projections of simple solids like prisms, pyramids, cylinder, cone sphere, frustum of solids and also their combinations.
INTERSECTION OF SURFACES: Intersection of surfaces of two solids as given below.
(i) Cylinder and cylinder
(ii) Prism and prism.
(iii) Cone and Cylinder
(Only cases where the axes are perpendicular to each other and intersecting with or without offset.)

CAD: Introduction to CAD systems, Benefits of CAD, Various Softwares for CAD, Demonstration of any one CAD software.

General Note:
(i) First angle projection to be followed
(ii) Question paper shall contain 3 questions from each module, except from CAD. Students are required to answer any two questions from each module.

(iii) Distribution of marks
Module - I 2 x 16 = 32
Module -II 2 x 17 = 34
Module III 2 x 17 = 34

100
REFERENCES
Luzadder and Duff; *Fundamentals of Engineering Drawing*
N. D. Bhatt; *Engineering Drawing*
K. Venugopal; *Engineering Drawing and Graphics*
P.S. Gill; *Engineering Graphics*
P.I. Varghese; *Engineering Graphics*
K.R. Gopalakrishnan; *Engineering Drawing*
Thamaraselvi; *Engineering Drawing*
K.C. John; *Engineering Graphics*
K.N. Anil Kumar; *Engineering Graphics*
08.105 ENGINEERING MECHANICS

L-T-P: 2 - 1 – 0

Credits: 6

MODULE I (20 HRS)
Idealizations of Mechanics- Elements of vector algebra
Types of supports - types of beams - types of loading- Support reactions of simply supported and overhanging beams under different types of loading.
Forces in space, equations of equilibrium, Vector approach.

MODULE II (20 HRS)
Properties of surfaces- centroid of composite areas- Theorems of Pappus-Gouldinus- Moment of inertia of areas, Parallel and perpendicular axes theorems- Radius of Gyration- moment of inertia of composite areas.
Dynamics: Kinematics-Combined motion of translation and rotation-instantaneous centre, motion of link, motion of connecting rod and piston, wheel rolling without slipping.
Relative velocity - basic concepts-analysis of different types of problems
Kinetics- Newton’s laws of translatory motion- D’Alembert’s principle- Motion of lift- Motion of connected bodies.

MODULE III (20 HRS)
Collision of elastic bodies-Law of conservation of momentum-Direct and oblique impact between elastic bodies and impact with fixed plane.
Curvilinear motion- D’Alembert’s principle in curvilinear motion- Mass moment of inertia of rings, solid discs and solid spheres (no derivations required)Angular momentum-Angular impulse.
Kinetics of rigid bodies under combined translatory and rotational motion – work – energy principle for rigid bodies.
Centrifugal and centripetal forces – motion of vehicles on curved paths in horizontal and vertical planes – super elevation – stability of vehicles moving in curved paths (qualitative ideas only).

REFERENCES:

Note
Question For University Examination:- Part A – 8 compulsory questions covering entire syllabus, 5 marks each. (5 x 8 = 40) Part B – Three questions of 10 marks from each module, out of which two should be answered (10 x 2 x 3 = 60).
08.106 BASIC CIVIL ENGINEERING

Credits: 6

MODULE I

Surveying: Object and Principles of Surveying.
Linear Measurements: Direct measurements - Tape & chain only - Ranging out survey lines-Taking measurements of sloping ground - Errors - Tape correction (problems).
Levelling: Levelling instruments - Level (Dumpy Level, Tilting Level ) Levelling Staff. Measurements in levelling - Temporary adjustments of a level, holding the staff, reading the staff - Principles of leveling - recording measurements in the field book - reduction of level - height of collimation method only (simple examples).
Contour maps (Brief description only). Computation of areas - Mid ordinate rule, average ordinate rule, Trapezoidal rule, Simpson’s rule (examples)- Introduction to Distomat, Total Station & GPS (Brief description only)

MODULE II

Building construction: Selection of site for buildings - types of buildings - Components of buildings.
Foundation: Different types - Spread footing, Isolated footing, Combined footing, Mat foundation, Pile foundation (description only).
Safe Bearing Capacity of Soil: Importance of determination of the Safe Bearing Capacity of Soil (brief description only).
Super structure: Masonry - stone masonry, brick masonry -Types- desirable qualities of stone and brick.
Partition: Materials used for making partition - plywood, particle boards & glass.
Doors, windows & ventilators: Types - materials used for the construction of doors and windows - wood, steel & Aluminium.
Plastering: Mortar – properties - Preparation of Cement mortar

MODULE III

Concrete: Ingredients- cement, aggregate, and water. Qualities of ingredients (brief description only).
Tests on Cement - consistency, initial and final setting times. Compressive strength -IS Specifications.
Aggregates – desirable qualities of fine and coarse aggregates
Steel-common types used in construction- Mild Steel, HYSD Steel and their properties.
Reinforced Cement Concrete (RCC)-advantages of RCC over Plain Cement Concrete.
Elementary ideas on pre-cast and pre-stressed concrete constructions.
Building services - vertical transportation – stairs – types, escalators and elevators, ramps (brief description only). Plumbing services- brief description of water supply and sewage disposal arrangements for residential buildings.

REFERENCE:

B.C Punmia, “Surveying & Leveling” Vol. – I, Laxmi publications(P) Ltd,N.Delhi, 2004
Rangwala., Building Materials,Charotar publishing house, 2001

21
Jha and Sinha, “Construction and Technology”
Narayanan and Lalu Mangal, ”Introduction to Civil Engineering” Phasor Books, Kollam.
Santha Minu, “Basic Civil Engineering” Karunya Publications, Trivandrum

Note: The question paper will consists of two parts. Part I and part II.

Part I is Compulsory covering the entire syllabus, for 40 marks. It contains 8 questions of 5 marks each.
Part II is to cover 3 modules. There will be two questions (20 marks each) from each module out of which one from each module is to be answered. (20 X 3 = 60)
08.107  BASIC MECHANICAL ENGINEERING

L-T-P/D: 2-1-0                                 Cred its: 6

MODULE I
Thermodynamics: Basic concepts and definitions of Zeroth law, First law, Second law of thermodynamics- concept of reversibility and entropy, p-v and T-s diagrams
Air cycles: Carnot, Otto and Diesel cycles-Air standard efficiency (simple problems)
IC Engines: Working and comparison of two stroke and four stroke petrol and diesel engines - general description of various systems using block diagrams – air system, fuel system, ignition system and governing system. A brief description of CRDI, MPFI, GDI and Hybrid Vehicles
Steam boilers: Classification – Cochran boiler, Babcock and Wilcox boiler, Benson boiler- fluidized bed combustion,

MODULE II
Principles and fields of application of - compressors - reciprocating and centrifugal, blower, pumps-reciprocating, centrifugal and jet pumps, steam and hydraulic turbines- impulse and reaction, gas turbine cycles- open and closed
Elementary ideas of hydro electric, thermal and nuclear power plants
Refrigeration & Air Conditioning: Refrigerants, CFC free refrigerants. Vapor compression refrigeration system, Comfort and Industrial air conditioning-typical window air conditioning unit (general description only).

MODULE III
Mechanical Power transmission systems: Belt, rope and gear drives-types, comparison and fields of application-velocity ratio-slip (simple problems) friction disc, single plate clutch, gear trains (no derivations).
Manufacturing processes: Elementary ideas of casting, forging, rolling, welding, soldering and brazing
Machining processes- turning, taper turning, thread cutting, shaping, drilling, grinding, milling (simple sketches and short notes).
Non conventional machining - Electro discharge machining (EDM) and Electro chemical machining (ECM)
Principle, application and advantages of C N C machine

REFERENCES
Spalding and Cole, “Engineering Thermodynamics”
Gill, Smith and Zuirys, “Fundamentals of IC Engines”
Amstead, Ostwald and Begeman, “Manufacturing processes”
Crouse, “Automobile Engineering”
Roy and Choudhary, “Elements of Mechanical Engineering”
Hajra Choudhary, “Workshop Technology”
R K Bensal, “Fluid mechanics and machines”
J Benjamin, “Basic Mechanical Engineering”

Note: Lectures are to be supplemented by demonstration in laboratories.

Note: The question paper will consist of two parts. Part I is to be compulsory for 40 marks. This may contain 10 questions of 4 marks each. Part II is to cover 3 modules. There can be 3 questions from each module (10 marks each) out of which 2 are to be answered.
08.108  BASIC ELECTRICAL AND ELECTRONICS ENGINEERING  
L-T-P:2–1-0  
Credits 6

MODULE – I

Alternating current fundamentals - generation of alternating currents - waveforms - frequency - period - average and rms values - form factor. Phasor representation of alternating quantities - rectangular polar and exponential forms.

Analysis of simple ac circuits - concept of impedance and admittance - phasor representation - j notation - power and power factor in ac circuits - active and reactive components. Solution of RL, RC and RLC series circuits.

Three phase systems - generation of three phase voltage - star and delta connection - relation between phase and line values of voltage and current - phasor representation - three wire and four wire systems.

Measurement of power in three phase circuits (two wattmeter method). Measurement of energy - working of I-phase energy meter.

MODULE – II
Transformers - Principle of operation - EMF equation - constructional details of single phase and three phase transformers

Methods of bulk generation of electric power. Block schematic of layout of generating stations - hydroelectric, thermal and nuclear power plants. Renewable energy sources - solar, wind, tidal, wave and geothermal energy.

Bulk transmission of electric power - typical electrical power transmission scheme - need for high transmission voltage - substations - substation equipments. Primary and secondary transmission and distribution systems

Different methods of wiring for LT installations. Schematic layout of LT switchboards. Earthing of installations - necessity of earthing - plate and pipe earthing. Protective fuses, MCBs, ELCBs and switches.

Working of incandescent lamps, fluorescent lamps, energy efficient lamps

MODULE – III
Diodes - PN junction diodes, V-I characteristics, dynamic & static resistance, principle of working and V-I characteristics of Zener diode, principle of Photo diode, Solar cell, & LED.

Rectifiers & power supplies - block diagram description of a dc power supply, circuit diagram & working of half-wave & full wave rectifier, final equations of VRms, Vdc, ripple factor and peak inverse voltage in each case, principle of working of series inductor and shunt capacitor filters.

Working of simple zener voltage regulator.

Power devices – V – I characteristics and applications of SCR and Triac Working principle of UPS and SMPS

Transducers – Resistance strain guage, thermistor, LVDT

REFERENCES
TP Imthias Ahmed, B. Premlet, “Introduction to Electrical Engineering”, Phaser Books, Kollam
Gopakumar, “Introduction To Electronics and Communications”, Phasor Books, Kollam

Note: The question paper will consist of two parts. Part – A is to be compulsory for 40 marks (10 questions of 4 marks each). Part-B is to cover 3 modules for 60 marks. (50% choice- One out of two or two out of four from each module).
08.109  BASIC COMMUNICATION AND INFORMATION ENGINEERING

L-T-P: 2-1-0  Credits: 6

MODULE I (Qualitative Treatment)
(a) Bipolar junction transistors: NPN & PNP transistors, structure, typical doping, working of NPN transistor, concepts of common base, common emitter & common collector configurations, current gain of each, input & output characteristics of common emitter configuration, comparison of three configurations with reference to voltage & current gain, input & output resistances and applications. (6 hrs)
(b) Field effect Transistors: basic principles of JFET, MESFET and MOSFET, comparison with BJT. (3 hrs)
(c) Amplifiers & Oscillators: circuit diagram & working of common emitter amplifier, function of each component in the circuit, need of proper biasing, frequency response, voltage gain and 3dB bandwidth, concepts of class A, B, AB and Class C power amplifiers, circuit diagram & working of push pull amplifiers, concepts of feedback, working principles of oscillators, circuit diagram & working of RC phase shift oscillator (7 hrs)
(d) Integrated circuits: advantages of ICs, analog and digital ICs, functional block diagram of operational amplifier, ideal operational amplifier, use as inverting amplifier, non inverting amplifier, summing amplifier, integrator and comparator. (4 hrs)
(e) Digital ICs: logic gates, realization of logic functions, principle of combinational and sequential logic circuits, flip flop (JK), logic families: TTL and CMOS Logic (No internal diagram) (4 hrs)
(f) IC fabrication: purification of silicon, crystal growth, wafer preparation. unit process: oxidation, diffusion, ion implantation, epitaxy, deposition, photolithography. (4 hrs)

MODULE II (Qualitative Treatment)
(a) Measurements: principle and block diagram of analog and digital multimeter, working principle of CRT, block diagram of CRO, measurements using CRO, principle of digital storage oscilloscope, principle and block diagram of function generator. (5 hrs)
(c) Color television: TV Standards interlaced scanning, block diagram of PAL TV transmitter & receiver, basic principles of cable TV, CCTV system, basic principles of HDTV, basic principles of LCD & Plasma displays. (5 hrs)
(d) Radar and navigation: principle of radar and radar equation, block schematics of pulsed radar, factors affecting range, applications of radar in measurements and navigation. (4 hrs)
(e) Satellite communication: microwave frequency bands, concept of geo-stationary satellite, frequency bands used, satellite transponder, block diagram of earth station transmitter & receiver, advantages of satellite communication, principle of Global Positioning System (GPS). (3 hrs)
(f) Optical communication: block diagram of the optical communication system, principle of light transmission through fiber, concepts of Single Mode and Multi Mode optical fiber, working principle of source (semiconductor Laser) & detector (PIN,APD), advantages of optical communication. (5 hrs)

MODULE III (Qualitative Treatment)
(a) Computer Architecture: functional units: basic concept of ALU- data path and control, memory hierarchy, caches, main memory, virtual memory, operating systems, microprocessors - functional block diagram of 8085 (9 hrs)
(b) Data communication: overview, analog and digital data transmission, transmission media, digitization of wave forms, PCM, digital modulation techniques- ASK, PSK, FSK, basic concepts of error detection, parity checking. (6 hrs)
(c) **Mobile communication**: basic principles of cellular communications, concepts of cells, frequency reuse, principle and block diagram of GSM, principle of CDMA, WLL & GPRS technologies. (4 hrs)

(d) **Internet Technology**: concepts of networking: client-server computing, IP addresses, domain names, network interface unit - modem, switching technologies - circuit switching and packet switching, LAN, MAN, WAN & World Wide web, network topologies, communication protocols - TCP/IP, Introduction to web languages - HTML, XML, internetworking concepts, network devices - basic principles of router, bridge, switch, network security - Firewall. (7 hrs)

**REFERENCES**

Santiram Kal, *Basic Electronics – Devices, Circuits and IT fundamentals*, PHI
M. Moris Mano, *Computer Architecture*, PHI
Neil H E Weste, Kamran Eshraghian, *Principles of CMOS VLSI design – A system perspective*, Pearson Education [Module 1 (f)]

David A. Bell, *Electronic Instrumentation and Measurements*, PHI [Module 2 (a)]
N N Bhargava, D C Kulshreshtha, S C Gupta, *Basic Electronics & Linear Circuits*, TMH

R.R. Gulati, *Monochrome and Colour Television*, New Age International [Module 2 (c)]
K Gopakumar, *Introduction to Electronics & Communication*, 3rd edition, 2008, Phasor Publisher’s, Kollam

This subject shall be handled by faculty of Dept. of Electronics and Communication.

**Question Paper**

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
08.110 ENGINEERING WORKSHOPS

L-T-P: 0-0-2

Carpentry:

B. Fitting:
Study of tools, Practice in filing, cutting, drilling and tapping. Male and female joints, Stepped joints.

C: Sheet Metal Work:
Study of tools. Selection of different gauge GI sheets for jobs. Practice on riveted joints. Preparing tube joints, frustums, trays and containers.

Plumbing:
Study of tools. Details of plumbing work in domestic and industrial applications. Study of pipe joints, cutting, threading and laying of pipes with different fittings using PVC pipes. Use of special tools in plumbing work.

E: Foundry:
Study of tools. Preparation of sand, moulding practice and demonstration of casting.

F. Welding:
Study of welding machines. Straight line practices, Making of Butt joint, T joint and Lap joint.

G: Smithy:
Study of tools. Demonstration on forging of square prism, hexagonal bolt, T bolt and Eye bolt.

H: Machine Tools:
Study and demonstration on working of machine tools. Lathe and Drilling machine.

NOTE: For the university examination the student shall be examined in sections A, B, C, D and E only.
Module I

Module II
Fourier Transforms: Fourier integral theorem (no proof)- Fourier transforms – Fourier sine and cosine transforms, inverse Fourier transforms, properties

Module III
Application of PDE: Derivation of one dimensional Wave and Heat equations. Solution by separation of variables. Boundary value problems in one dimensional Wave and Heat equations.

References:
Michel D Greenberg, Advanced Engineering Mathematics, Pearson

Question Paper
The question paper shall consist of two parts. Part A (40 marks) Ten compulsory questions of 4 marks each. Part B (60 marks) Students must answer one out of two from each module. Each question carries 20 marks.
08.302 SOLID STATE DEVICES (TA)

L-T-P: 3-1-0

Module I
Carrier transport in semiconductors – drift, conductivity and mobility, variation of mobility with temperature and doping, High Field Effects, Hall effect.
Excess carriers in semiconductors – Generation and recombination mechanisms of excess carriers, quasi Fermi levels, diffusion, Einstein relations. Continuity equations.
PN junctions - Contact potential, Electrical Field, Potential and Charge Density at the junction, Energy band diagram, Minority Carrier Distribution, Ideal diode equation, Electron and hole component of current in forward biased p-n junction, effect of Temperature on I-V characteristics.
Real diodes. High level injection effects. Diode capacitances, switching transients.

Module II
Electrical Breakdown in PN junctions - Zener and avalanche break down (abrupt PN junctions only), Linearly graded junction - electric field, built in potential, junction capacitance.
Metal Semiconductor contacts, Energy band diagram of Ohmic and Rectifying Contacts, Current Equation, Comparison with PN Junction Diode.
Hetero Junctions – Energy band diagram, Applications.
Bipolar junction transistor - current components, Minority Carrier Distributions basic parameters, Evaluation of terminal currents and dc parameters (based on physical dimensions), Switching, Base width modulation, Avalanche multiplication in collector-base junction, Punch Through, Base resistance, Static I-V characteristics of CB and CE configurations.

Module III
Field Effect Transistors: JFET - principle of operation, current equation, static I-V characteristics, and device parameters.
MOS Capacitor - Ideal MOS Capacitor, Energy Band Diagram, Carrier Concentrations in the Space Charge Region, C-V characteristics, threshold voltage, effect of real surfaces.
MOSFET - Basic structure and principle of operation, I-V characteristics, Derivation of Drain Current (Square Law Model Only) and device parameters, Channel length modulation, Velocity saturation, Body effect, DIBL, Hot Electron Effect, Sub threshold Conduction.
UJT, PNPN diode, SCR, DIAC, TRIAC and IGBT – Principles of operation and static characteristics (no derivation)

Text Book:
Ben G. Streetman: Solid State Electronic Devices, 5/e, Pearson Education.

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(70% Numerical Problems and derivations)
**08.303 NETWORK ANALYSIS (TA)**

**Module I**
Elements of Network Analysis- Mesh and node analysis.
Network theorems: Thevenin’s theorem, Norton’s theorem, Super position theorem, Reciprocity theorem, Millman theorem, Maximum Power Transfer theorem.
Signal representation - Impulse, step, pulse and ramp function, waveform synthesis.

**Module II**
The concept of complex frequency - Network functions for the one port and two port - driving point and transfer functions - Poles and Zeros of network functions and their locations and effects on the time and frequency domain. Restriction of poles and zeros in the driving point and transfer function. Time domain behavior from the pole - zero plot.
Frequency response plots - Magnitude and phase plots, Plots from s-plane phasors, Bode plots - phase margin and gain margin.
Parameters of two-port network – impedance, admittance, transmission and hybrid - Conversion formulae.
Attenuators – propagation constant, types of attenuators – T, π and Balanced.

**Module III**
Resonance in series and parallel circuits- resonant frequency- bandwidth - Q factor, Selectivity.
Coupled circuits, single tuned and double tuned circuits, coefficient of coupling, Image Impedance, Characteristic impedance and propagation constant.
Introduction to filters- Filter approximations - poles of the Butterworth, Chebyshev and inverse Chebyshev functions, expression for transfer function of Butterworth Low pass filter, design for 2nd order and 3rd order low pass Butterworth filters, Bessel-Thomson response. Frequency transformations - transformations to high pass, band pass and band elimination.

**Text Book:**

**Reference:**
1. Franklin F. Kuo: *Network Analysis and Synthesis, 2/e*, Wiley India.
5. Sudhakar and S. P. Shyam Mohan: *Circuits and Network Analysis,3/e*, TMH.

**Question Paper**
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

*(Minimum 75% Problems)*
Module I

Module II
Function overloading, operator overloading, friend function, derived class (inheritance), polymorphism, virtual function, templates, Files and streams. Library functions for File and String operations. Introduction to Standard Template Library. Programming tools- make files, debuggers, revision control systems, exception handling.

Module III

Text Book:

Reference:
1. E Balaguruswamy, *Object Oriented Programming with C++*, 3/e, TMH.

This subject shall be handled by faculty of Dept.of Electronics and Communication in the Colleges.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 50% Programs)
Module I
DC analysis of BJTs - graphical analysis, BJT as amplifier. Small signal equivalent circuits (Low frequency $\pi$ model only). Transistor Biasing circuits, Stability factors, Thermal runaway.
Small signal analysis of CE, CB, CC configurations (gain, input and output impedance).
BJT as switch. – switching circuits – astable, monostable, bistable multivibrators and schmitt trigger circuits.
MOSFET I-V relation, graphical analysis, load lines, small signal parameters, small signal equivalent circuits, body effect, biasing of MOSFETs amplifiers.

Module II
Analysis of Single stage discrete MOSFET amplifiers – small signal voltage and current gain, input and output impedance of Basic CS amplifier, CS amplifier with source resistor, CS amplifier with source by pass capacitor, source follower amplifier, CG amplifier.
High frequency equivalent circuits of MOSFETs, Miller effect, short circuit current gain, s-domain analysis, amplifier transfer function. Low frequency and high frequency response of CS, CG, CD amplifiers.

Module III
Feed back amplifiers - Properties of negative feed back. The four basic feed back topologies-Series-shunt, series-series, shunt-shunt, shunt-series.
Analysis and design of discrete circuits in each feedback topologies (MOSFET based) - Voltage, Current, Transconductance and Transresistance amplifiers, loop gain, input and output impedance. Stability of feedback circuits.

Text Books:
2. Donald A Neamen: Electronic Circuit Analysis and Design, 3/e, TMH.

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. (Minimum 50% Problems)
Module I

Module II

Module III

Text books:

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 25% Problems)
08.307 ELECTRONIC DEVICES LAB (TA)

L-T-P : 0-0-3

Credits: 3

1. Characteristics of Diodes & Zener diodes
2. Characteristics of Transistors (CE & CB)
3. Characteristics of JFET and MOSFET
4. Characteristics of SCR
5. Frequency responses of RC Low pass and high pass filters. RC Integrating and Differentiating circuits.
7. RC Coupled CE amplifier - frequency response characteristics.
8. MOSFET amplifier (CS) - frequency response characteristics.
9. Clipping and clamping circuits.
10. Rectifiers-half wave, full wave, Bridge with and without filter- ripple factor and regulation.

Internal Marks: 50

1. Attendance - 10
2. Class work - 20
3. Practical internal Test - 20

Note: For University examination, the following guidelines should be followed regarding award of marks

(a) Circuit and design - 20%
(b) Performance (Wiring, usage of equipments and trouble shooting) - 15%
(c) Result - 35%
(d) Viva voce - 25%
(e) Record - 05%

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.
08.308  ELECTRONICS CIRCUITS & SIMULATION LAB (A)
L-T-P: 0-0-3  Credits: 3

PART –A

1. Feed back amplifiers (current series, voltage series). Gain and frequency response.
2. Power amplifiers (transformer less), Class B and Class AB.
5. Astable, Monostable and Bistable multivibrator circuits.
7. Series voltage regulator circuits – short circuit and fold back protection.

PART-B

Introduction to SPICE
Models of resistor, capacitor, inductor, energy sources (VCVS, CCVS, Sinusoidal source, pulse, etc) and transformer.
Models of DIODE, BJT, FET, MOSFET, etc. sub circuits.
Simulation of following circuits using spice (Schematic entry of circuits using standard packages).
Analysis- (transient, AC, DC, etc.):
   1. Potential divider.
   2. Integrator & Differentiator (I/P PULSE) – Frequency response of RC circuits.
   3. Diode Characteristics.
   4. BJT Characteristics.
   5. FET Characteristics.
   6. MOS characteristics.
   7. Full wave rectifiers (Transient analysis) including filter circuits.
   8. Voltage Regulators.
  10. RC Coupled amplifiers - Transient analysis and Frequency response.
  11. FET & MOSFET amplifiers.
  12. Multivibrators.

Internal Marks: 50
1. Attendance  - 10
2. Class work  - 20 ( For Part A only)
3. Practical internal Test  - 20 ( For Part B only)

Note: For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design  - 20%
(b) Performance (Wiring, usage of equipments and trouble shooting)  - 15%
(c) Result  - 35%
(d) Viva voce (Including Part-B also)  - 25%
(e) Record  - 05%

Practical examination (university) to be conducted covering entire syllabus given above in part-A.
Students shall be allowed for the University examination only on submitting the duly certified record (Including Part-A and Part-B).
The external examiner shall endorse the record.
Syllabus IV Semester

08.401 ENGINEERING MATHEMATICS - III PROBABILITY & RANDOM PROCESSES (TA)

L-T-P: 3-1-0 Credits: 4

Module I
Random Variables - Discrete and continuous random variables - Probability density functions and distribution functions - Mathematical Expectations - Properties - Binomial distribution, Poisson distribution, Uniform distribution (Mean and Variance - Problems) - Normal distribution, Rayleigh distribution (Problems) - Chebychev’s inequality (without proof) - Problems - Markov inequality (without proof) - Two dimensional random variables - Joint probability distribution - Marginal and conditional probability function - Independent random variables - Problems - Correlation and Covariance - Problems - Central limit theorem - Problems.

Module II
Random processes - Classification of random processes and examples - Continuous random process - Discrete random process - Continuous random sequence - Discrete random sequence - Stationary process and evolutionary process - Strict sense stationary process - Wide sense stationary process - Auto correlation, auto covariance and cross correlation - Their relation, properties and problems - Poisson process - Mean, variance, autocorrelation of the Poisson process - Properties (no proof) - Problems.

Module III
Markov process - Classification of Markov process - Markov chain - Transition probability matrix. Ergodic process - Time average of random process - Power spectral density and its properties - Spectral representation of real WSS process - Wiener-Khinchin Theorem (no proof) - Calculation of spectral density given the autocorrelation function - Linear time invariant systems - WSS process as input - Autocorrelation and spectral density as output (mention only) - Binomial, Wiener and Gaussian process (statements only).

References:
1. Papoulis and S.U. Pillai, Probability, random variable and stochastic processes, 4/e, TMH
2. Veerarajan, Probability and Random Processes, 2/e, TMH
3. Probability and Statistics, Schaum Series

Question Paper:
The question paper shall consist of two parts. Part A (40 marks) shall contain 10 compulsory questions of 4 marks each. Part B (60 marks) will have 3 modules. There shall be 2 questions from each module (20 marks each) out of which one is to be answered.

Note: This subject shall be handled by the faculty of Mathematics Department
PART I

ECONOMICS (2 Periods per week)

Module I
Meaning of Demand and Supply – Types of demand – Determinants of Demand – Demand forecasting
Production function – Law of Variable proportion – Returns to scale – Least cost combination of inputs – Cost concepts – Cost output relationship

Module II

PART II

ACCOUNTANCY (1 Period per week)

Module III
Final accounts: preparation of trading and profit and loss Account – Balance sheet (with simple problems) – Introduction to Accounting packages (Description only)

References:
K.K. Dewett, Modern Economic theory
Michael – Todaro, Economic Development Addison Wesley Longman Ltd.
Mohinder Kumar Sharma – Business Environment in India
Rudder Dutt and K.P.M Sundaran – Indian Economy
Hal R. Varian – Intermediate Micro Economics
Koutsiannis (second Edition) Micro Economics
Double Entry book Keeping – Batliboi
A Systematic approach to Accounting : Dr. K.G. Chandrasekharan Nair

Question Paper
Note: Part I and Part II to be answers in separate answer books.
Part – I Economics
Part A – 30 Marks (short answers) covering entire syllabus (3x10=30)
Part B – 40 marks (50% choice one out of two or two out of four from each module)
Part – II Accountancy
Three questions covering entire syllabus out of which two questions has to be answered (2x15=30)
Module I

Module II

Module III

Text Books:

Reference:
1. Alan V. Oppenheim, Alan S.Willsky: *Signals and Systems, 2/e*, PHI.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 75% Problems, derivations and proofs)
08.404 LINEAR INTEGRATED CIRCUITS (A)
L-T-P: 3-1-0

Module I
Current sources, Active load, cascode load, current mirror circuits, multistage differential amplifiers. MOS Operational Amplifiers, single stage- cascode and folded cascode, two stage op-amp, op-amp with output buffer, frequency compensation and slew rate in two stage Op-amps.
Ideal op-amp parameters, Non ideal op-amp. Effect of finite open loop gain, bandwidth and slew rate on circuit performance.

Module II
Active Filters : Transfer function, First order Active Filters, Standard second order responses, KRC filters, Multiple-Feedback filters, State variable and biquad filters, Filter approximation, Cascade design, Generalized Impedance Converter.
Switched capacitor, Switched capacitor Integrator, Switched capacitor filter, IInd order SC filter based on Tow-Thomas.
Data converters: Sample and hold characteristics, DAC and ADC specification, DAC architecture - Weighted resistor, R-2R ladder network, Current steering, Charge Scaling DACs, Cyclic DAC, Pipeline DAC
ADC architecture: Dual slope, Counter ramp, Successive approximation, Flash ADC, Pipeline ADC, Oversampling ADC.

Module III
Operational Transconductance amplifier. Emitter coupled pair as simple multiplier, Variable-Transconductance Multiplier, Multiplier applications.
Voltage Controlled Oscillator: Features of 566 VCO, Applications of VCO.
Monolithic Voltage Regulators – IC 723 and its Applications, Current boosting, short circuit and fold back protection, Three pin fixed and variable voltage regulators.
Power Amplifier: LM380 power audio amplifier.

Text Books:
1. Sergio Franco: Design with Operational Amplifiers and Analog Integrated Circuits, 3/e, TMH.

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 50% Problems and Analysis)
Module I
Binary codes, BCD, Review of Boolean algebra and Binary arithmetic.
Sum of product and product of sum simplification, Canonical forms, Karnaugh map (upto 4 variables), completely and incompletely specified functions. Quine McCluskey method (upto 5 variables).
Decoders, encoders, multiplexers, demultiplexers. Adders, subtractors, ripple carry and look ahead carry adders, BCD adders, binary comparators.
Description of Logic gates, decoders, encoders, adders using VHDL.
Integrated circuit technologies – Characteristics and Parameters.TTL circuits –NAND,Open collector, tristate gates. CMOS logic circuits - NOR, NOT, NAND. Comparison.

Module II
Sequential circuit models, flip flops – SR, JK, D, T, Master slave, characteristic equations, Flip flop timing specifications.
Binary counters – Synchronous and Asynchronous design, Counters for random sequence- design.
Registers, Universal shift registers, Ring and Johnson counter.
Multivibrators – astable and monostable multivibrators using gates, 74121 and 74123.
Memories – ROM, PROMs, RAMs – Basic structure, Static and dynamic RAMs.
Description of flip flops, registers and counters using VHDL.

Module III
Mealy and Moore models, state machine notation, state diagram, state table, transition table, exciting table and equations, synchronous sequential analysis – principles, examples.
Construction of state diagrams, sequential circuit design – state equivalence, state reduction, state assignment techniques, Analysis of synchronous sequential circuits – examples.
Asynchronous sequential circuit – basic structure, equivalence and minimization, minimization of completely specified machines, State simplification of redundant states, Incompletely specified machines.

Text Book:
2. John F Wakerly, Digital Design Principles and Practice, 4/e, Pearson Education.

Reference:
2. Thomas L Floyd, R.P Jain: Digital Fundamentals, 8/e, Pearson Education.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% Problems and design)
08.406 BASIC INSTRUMENTATION (A)

L-T-P: 2-1-0 Credits: 3

Module I

Module II

Module III

Text Books:
3. Helfrick & Cooper, Modern Electronic Instrumentation and Measurement Techniques, 5/e, PHI.

Reference:
4. Patranabis, "Sensors and Transducers", 2/e, PHI.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. (Minimum25% Problems and design)
08.407  DIGITAL INTEGRATED CIRCUITS & HDL  LAB  (A)
L-T-P: 0-0-4  Credits: 4

1. Characteristics of TTL and CMOS gates.
3. Astable and Monostable multivibrators using CMOS gates
5. Shift Registers, Ring counter and Johnson counter (using gates and 7495)
6. Counters, up/down counters (asynchronous & synchronous) using flip flops.
7. Counter ICs (7490,7493,7495).
8. Sequence generator.
9. BCD to Decimal and BCD to 7 segment decoder & display
10. Multiplexers, Demultiplexers using gates and ICs. (74150,74154)
11. Realization of combinational circuits using MUX & DEMUX.
    Logic gates, Decoders, Encoders, Half adder and Full adder, Flip-flops,
    counters etc. in VHDL

Internal Marks: 50
1. Attendance       - 10
2. Class work       - 20
3. Practical internal Test       - 20

Note: For University examination, the following guidelines should be followed regarding award of marks.

(a) Circuit and design       - 20%
(b) Performance (Wiring, usage of equipments and trouble shooting)       - 15%
(c) Result       - 35%
(d) Viva voce       - 25%
(e) Record       - 05%

Practical examination to be conducted covering entire syllabus given above (without 14th expt).
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.
1. Op amp measurements: input offset voltage, input offset current, open loop gain, common mode input resistance, slew rate, CMRR, full power band width comparison of different classes of opamps (2 expts)
2. Op Amp basic circuits – Inverting and Non-inverting Amplifier, Integrator, Comparator.
4. Universal active filters using Op-Amps (741/747/324)
5. ADC & DAC using ICs.
6. Instrumentation amplifier & differential amplifiers using Op-Amps (measurement of CMRR)
7. Transducer measurements.
   a. Diode thermometer
   b. LVDT
   c. Strain gauge.
   d. Pressure transducer.
   e. Thermocouple & RTDS
   f. Photocells
9. Phase locked loops, frequency to voltage converter, voltage to frequency converter
10. Programmable logic controllers – ladder diagrams
11. Design of temperature transmitter using RTD.
12. Design of cold junction compensation circuit.
13. Design of IC temperature transmitter.
15. Performance evaluation of pressure transmitters using Dead weight tester.

**Internal Marks: 50**
1. Attendance - 10
2. Class work - 20
3. Practical internal Test - 20

**Note:** For University examination, the following guidelines should be followed regarding award of marks.

- (a) Circuit and design - 20%
- (b) Performance (Wiring, usage of equipments and trouble shooting) - 15%
- (c) Result - 35%
- (d) Viva voce - 25%
- (e) Record - 05%

**Practical examination to be conducted covering entire syllabus given above. Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.**
Syllabus V Semester

08.501 ENGINEERING MATHEMATICS – IV
COMPLEX ANALYSIS AND LINEAR ALGEBRA (TA)

L-T-P : 3-1-0 

Credits: 4

Module I
Conformal mapping - The transformations $w = 1/z$, $w = z^2$, $w = z + 1/z$, $w = \sin z$, $w = \cos z$, bilinear transformations

Module II
Complex Integration – Line integral - Cauchy’s integral theorem - Cauchy’s integral formula - Power series - Taylor’s and Laurent’s series - Zeros, Poles and singularities - Residues and Residue theorem -Evaluation of real definite integrals

$\int_0^{2\pi} f(\sin \theta, \cos \theta) \, d\theta$,

$\int_{-\infty}^{\infty} f(x) \, dx$

(with no poles on the real axis) - (proof of theorems not required)

Module III
Partitioned matrices and matrix factorization - LU decompositions - Vector space and subspace - Null space and Column spaces - Bases - Co-ordinate systems - Dimension of vector space - Rank - Change of basis - Inner product space - Length and orthogonality - Orthogonal sets - Orthogonal projection - Gram-Schmidt process - Least square problem - Quadratic form - Constrained optimization of quadratic forms - Singular value decomposition (proof of the theorem are not included)

References:
David C Lay, Linear Algebra with Applications, Pearson Education.
Schaum Series, Linear Algebra.
Kenneth Hoffmann and Ray Kunze, Linear Algebra, PHI.
Gareth Williams, Linear Algebra with Applications, Jones and Bartlett publications.
Gilbert Strang, Linear Algebra with Applications, Thomson Learning.

Question Paper:
The question paper shall consist of two parts. PartA (40 marks) shall contain 10 compulsory questions of 4 marks each. PartB (60 marks) will have 3 modules. There shall be 2 questions from each module (20 marks each) out of which one is to be answered.

Note: This subject shall be handled by the faculty of Mathematics Department.
Module I
The Discrete Fourier Transform – Frequency Domain Sampling, Properties of DFT, Linear Filtering Methods Based on the DFT, Frequency Analysis of Signals using DFT. Computation of DFT - FFT Algorithms (Radix 2 only), Efficient computation of DFT of Two Real Sequences and a 2N-Point Real Sequence, Linear Filtering and Correlation using DFT. Introduction to DCT and properties.

Module II
Design of FIR Filters- Symmetric and Antisymmetric FIR Filters, FIR Filters using Window method and Frequency Sampling Method, Design of Optimum Equiripple Linear-Phase FIR Filters. Design of IIR Digital Filters from Analog Filters- IIR Filter Design by Impulse Invariance, IIR Filter Design by Bilinear Transformation, Frequency Transformations in the Analog and Digital Domain. Filter structures: FIR Systems- Direct Form, Cascade Form and Lattice Structure. IIR Systems- Direct Form, Transposed Form, Cascade Form and Parallel Form.

Module III

Text Books

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. (Minimum 75% Problems, derivations and proofs)
Module I
Instruction formats – Survey of addressing modes - CISC and RISC.
Computer Arithmetic – Implementing addition, subtraction, multiplication and division – Floating point representation – Floating point operations & their implementation.
MIPS – architecture, addressing modes , instruction format and instruction set.
Translating a C program into MIPS assembly language and machine codes.

Module II
Design of Data path and Control ( based on MIPS instruction set) - Design of data path to cover the basic memory reference (lw & sw), arithmetic/logical (add, sub, and, or) and branch instructions – Control of the single clock cycle implementation – Multi cycle implementation – Fetch, Decode, Execute and Memory access cycles – Design of control unit – Hardwired and Microprogrammed control.

Module III
Interfacing I/O to Processor. Interrupts and Direct Memory Access.
CISC microprocessors. Architecture of Intel 8086 - CPU, pin functions, instruction cycle time, addressing. Modes. VLIW architecture.

Text Book:
3. Douglas V Hall, *Microprocessors and Interfacing: Programming and Hardware*, 2/e, TMH.

References:

This subject shall be handled by faculty of Dept.of Electronics and Communication.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 40% Problems and design)
08.504 CONTROL SYSTEM THEORY (A)

L-T-P 2-1-0

Credits: 3

Module I

Module II

Module III
Control system design by frequency response – Lead, Lag and Leg-lead compensation. PID controls – Tuning rules of PID controllers – optimal sets of parameter values – Modifications of PID control schemes. Two degree of freedom control. Zero placement approach and design.

Text Book:
1. Katsuhiko Ogata, Modern Control Engineering, 4/e, Pearson Education.

References:
1. Benjamin .C Kuo, Automatic Control Systems, 8/e, PHI.
3. Richard C Dorf and Robert H Bishop, Modern Control System. 9/e, Pearson Education.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 75% Problems, derivations and proofs)
Module I
Power electronics versus Linear electronics, Classification of power processors and converters. Power semiconductor switches: Power diodes- structure, static and dynamic characteristics, power diode types. Power transistors- Power BJT, Power MOSFET, GTO and IGBT – structure and V/I characteristics, Steady state and switching characteristics of BJT and Power MOSFET. Drive circuits - requirements and design of simple drive circuits for power BJT, MOSFET and IGBT. Snubber circuits. Single phase and Three phase Rectifiers – Uncontrolled and Controlled rectifiers.

Module II

Module III

Text Books:

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% questions shall be problems, design and analysis)
08.506 LOGIC SYNTHESIS AND VERIFICATION (TA)

L-T-P : 2-1-0 Credits: 3

Module I
Graph theory - Directed and undirected graphs- Strongly Connected Components (SCC), Graph Traversal (BFS, DFS). General purpose methods for Combinatorial Optimization problems. Graph Optimization problems and Algorithms - Shortest Path - Critical Path- Graph Coloring - Graph Covering, Heuristic and Exact Algorithms.

Module II
Sequential Systems - models - FSM:- Minimization of FSM, FSM Traversal, FST, FSM Equivalence Checking, FSM Traversal using BDD. Minimization of Completely and Incompletely specified State Machines- State Encoding Algorithms- Decomposition and Encoding.

Module III
Finite Automata(DFA), DFA Synthesis, w-regular automata, Formal Verification with L-Automata.

Reference:

Reading:
5. Frederick J Hill, GR Peterson, Computer Aided Logical Design with Emphasis on VLSI, 4/e,John Wiley and sons.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 50% logical/numerical problems, derivation and Proof)
Module I

Module II

Module III
Applications-Fuzzy logic controllers, Types of FLC-Types of Fuzzy rule formats. Block diagram of fuzzy logic controller. Multi input multi output control system. Fuzzy control of a cement kiln, Automatic train operating system, Fuzzy pattern recognition. Inverted pendulum, aircraft landing control, air conditioner control.

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 75% logical/numerical problems, derivation and Proof)
Module I

Module II
Compilers and Interpreters: Aspects of compilation, Memory allocation, Interpreters. Linkers: Relocation and linking concepts. Software tools: Software tools for program development.

Module III

Textbook
1. D M Dhamdhere, System programming and, Operating systems 2nd revised edition, TMH.

References
1. Milan Milenkovic, Operating Systems, 2/e, TMH.
2. John J Donovan, System Programming, 2/e, McGraHill.

This subject shall be handled by faculty of Dept. of Electronics and Communication.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
Module I
ANN models for Pattern Classification – Hebb Net, Perceptrons, ADALINE networks (Architecture, Algorithm and simple Applications)

Module II

Module III
Adaptive Resonance Theory:- ART 1 and ART 2 – Back Propagation Networks, Learning with Momentum, - Radial Basis Function Networks - Conjugate Gradient Learning, Bias and Variance, Under-Fitting and Over-Fitting – Bolzmann machine (Architecture, Algorithms and Applications)

Text Books:
- Simon Haykin, *Neural Networks*, 2/e, Prentice Hall.
- Christopher M. Bishop, *Neural Networks for Pattern Recognition* by Oxford University Press, 1995.

Reference:

Question Paper:
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 50% Problem and Algorithm)
Module I


Module II

Module III

Text Books:

References:
2. Perry D. L., *VHDL Programming by Example*, 4/e, TMH.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problem, Design and Programs)
08.556 PROFESSIONAL COMMUNICATION(TA)

L-T-P : 2-1-0  

Credits: 3

Module I

Module II

Module III

PRACTICALS: (No University Examination)

REFERENCES:

Internal Marks:
50 Marks is to be awarded for the continuous evaluation in the practical done in a language lab with the syllabus given above.(one hour per week)

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
Module I

Module II

Module III
CMOS oscillators – ring oscillators, LC oscillators, CMOS VCO, CMOS PLL, non-ideal effects in PLL, delay locked loops and application. CMOS data converters -Medium and High-speed CMOS data converters- Over sampling converters. CMOS comparators, multipliers and wave shaping circuits. CMOS inverters – static and dynamic characteristics. Domino and NORA logic, combinational and sequential circuits.

Text Books:

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 50% marks for problems and design.)
LIST OF EXPERIMENTS

1. Sine triangle PWM generation
2. Study of PWM IC TL 494
3. Power BJT and MOSFET drive circuits
4. Battery charger circuit
5. Buck DC-DC Converters
6. Step up DC-DC converter
7. Push pull DC- DC Converter
8. Application of opto-coupler IC MCT2E
9. AC phase control circuit
10. Linear ramp firing circuits
11. Simple SMPS
12. Half bridge and full bridge converters
13. Study of DC Drive
14. Regulation Characteristics of DC Drive
15. Basic Inverter Circuits

Internal Marks: 50
1. Attendance - 10
2. Class work - 20
3. Practical internal Test - 20

Note: For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design - 20%
(b) Performance (Wiring, usage of equipments and trouble shooting) - 15%
(c) Result - 35%
(d) Viva voce - 25%
(e) Record - 05%

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.
1. No-load and Load Characteristics of DC Shunt and Compound Generator.
2. Load Characteristics of DC Series Motor.
4. Transformation Ratio and load test on single phase transformer.
5. Open Circuit and Short Circuit Tests on 1-phase Transformer.
8. Load Test on 1-phase Induction Motor.
9. Load Test on 3-phase Alternator.
10. Electrical Braking of DC motor.
11. Speed control of DC Shunt motor.

Internal Marks: 50
1. Attendance - 10
2. Class work - 20
3. Practical internal Test - 20

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.
Syllabus VI Semester

08.601 MICROCONTROLLER BASED SYSTEM DESIGN (TA)

L-T-P : 3-1-0  
Credits: 4

Module I
Introduction to microcontrollers, general architecture of microcontrollers and microprocessors, types of microcontrollers, embedded processors. Overview of the 8051 family. 8051 architecture- memory organization, registers and I/O ports. Addressing modes, instruction sets, and assembly language programming. Introduction to C programming in 8051, Watchdog timer, Power down mode: idle/sleep mode.

Module II

Module III
Microcontroller RISC family-ARM processor fundamentals: Register Organisation, pipeline, core. ARM instruction sets: data processing, branch, load-store, interrupts & program status register instructions. Exceptions & interrupts: handling & priorities. Development & Debugging tools for microcontroller based system design: software and hardware tools like {cross assembler, compiler, debugger, simulator, in-circuit emulator and logic analyser

Text Book:
2. PIC 16F877 data book

References
1. ARM processor Data book.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 25% Assembly language programs (8051 based) and 25% design)
Module I

Module II

Module III
CMOS system design- Adders, Static adder, Dynamic adder, Carry bypass adder, Linear Carry select adder, Square root carry select adder, Carry look ahead adder, Register based multipliers, Array multipliers. Memory elements- Timing matrix of Sequential circuits, Static and Dynamic Memory Latches and Registers, Multiplexer based latches, SRAM, DRAM, ROM. Sense amplifiers – Differential, Single ended. Reliability and testing of VLSI circuits – General concept, CMOS testing, Test generation methods. Introduction to VLSI design tools. Introduction to PLDs-PLA Design, folding of PLAs and familiarization of FPGAs.

Text Books:
1. M.S.Tyagi: Introduction to Semiconductor Materials, Wiley India,

References:
S K Gandhi: VLSI Fabrication Principles, 2/e, Prentice Hall.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 25 % problems)
Module I
Optical fibers and their properties - principles of light propagation through a fiber, different types of fibers and their properties, transmission characteristics of optical fiber, absorption losses, scattering losses, dispersion, optical sources and detectors – LED-PIN and APD.
Optical fiber sensors - Intensity modulated optical fiber sensors, Reflective Evanescent wave and microbend fiber optic sensors, Fiber optic refractometers & thermometers, distributed sensing with fiber optic sensors, interferometric optical fiber sensors, moiré fringes, measurement of -current, pressure, temperature, liquid level, strain, current and voltage using optical fiber sensors.

Module II
Laser fundamentals - fundamental characteristics of Lasers, three level and four level lasers, properties of laser, laser modes, resonator configuration, Q-switching and mode locking, cavity dumping, types of lasers - gas, solid, liquid and semiconductor lasers.
Industrial application of Lasers - Laser for measurement of - distance, length, velocity, acceleration, current, voltage and atmospheric effect. Laser for material processing – laser heating, welding melting and trimming of materials, removal and vaporization.

Module III
Medical applications of lasers - laser and tissue interaction, Laser instruments for - surgery, removal of tumors of vocal cords, brain surgery, plastic surgery, gynecology and oncology.
Holography & Interferometry - principles of Holography, Gabor’s hologram, Leith’s and Upatneik’s techniques in holography, point holograms, fourier transform holograms, acoustic holography, holographic interferometry and applications, Applications of holography in non-destructive testing and instrumentation.

Text books:

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 40% Problem and derivation)
Module I
Electro physiology - Review of physiology and anatomy, resting potential, action potential, bioelectric potentials, cardiovascular dynamics, electrode theory, bipolar and unipolar electrodes, surface electrodes, physiological transducers. Systems approach to biological systems.
Bioelectric potential and cardiovascular measurements - EMG - Evoked potential response, EEG, foetal monitor. ECG phonocardiography, vector cardiograph, BP, blood flow cardiac output, plethysmography, impedance cardiology, cardiac arrhythmia’s, pace makers, defibrillators.

Module II
Respirator and pulmonary measurements and rehabilitation - Physiology of respiratory system, respiratory rate measurement, artificial respirator, oximeter, hearing aids, functional neuromuscular simulation, physiotherapy, diathermy, nerve stimulator, artificial kidney machine.
Patient monitoring systems - Intensive cardiac care, bedside and central monitoring systems, patient monitoring through bio-telemetry, implanted transmitters, telemetering multiple information. Sources of electrical hazards and safety techniques.

Module III
Recent trends - Medical imaging, X-rays, laser applications, ultrasound scanner, echo cardiography, CT Scan MRI/NMR, cine angiogram, colour doppler systems, Holter monitoring, endoscopy.
Bioinformatics – Introduction, protein information resources, genome information resources, DNA sequence analysis, Pairwise alignment techniques.

Text Book:
1. Leslie Cromwell, Fred J. Weibell and Erich A. Pfeiffer, Biomedical Instrumentation and Measurements, 2/e, PHI.

References:
3. B.D.Ratner and Hoffman, Biomaterials Science-An Introduction to Materials in Medicine, 2/e, Elsevier.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
Module I
Analog Communication Systems- Principles of Amplitude modulation, double and single side band, suppressed carrier principle and system, AM modulation and demodulation circuits, AM Transmitters, Radio receivers, Angle modulation, Frequency modulation and demodulation methods, FM stereo broadcasting.Comparision of AM and FM.

Module II
Data Communication Techniques - Data transmission using analog carriers, FSK, PSK, DPSK, QPSK, and QAM.Carrier and Clock recovery,DPSK, error and bit error rate performance.
Satellite communication –Kepler’s laws, Orbits,Geosynchroneous and Geostationary satellites,Antenna look angles,Satellite link models and equations,Link budget.

Module III

Text Books:
Module I

Module-II
Wayne Tomasi, *Advanced Electronic Communications Systems*, 6/e, Pearson Education.

Module-III
William stallings, *Data and Computer Communication*, 4/e, PHI/Pearson Education.

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 25% Problem, derivation and Proof)
08.606 SPEECH PROCESSING (TA)  
L-T-P : 2-1-0  
Credits: 3

Module I
Speech production and perception. Time frequency representation of speech - spectrogram, speech features from spectrogram.  
Classification of Speech Sounds - Vowels, Consonants, Diphthongs, nasal consonants, fricatives, Voice and unvoiced speech. Pitch and pitch detection.  
STFT analysis of speech, Sinusoidal model of speech, Homomorphic filtering.

Module II

Module III
HMM based speech recognizer - Definition of HMM, Formulation of speech recognition process using HMM.

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.  
(Minimum 60% problems, derivations and proof)

Assignment for Sessional marks shall be problems based on MATLAB / any other software packages covering the syllabus above.
Module I
Linear optimum filtering and adaptive filtering, linear filter structures, adaptive equalization, noise cancellation and beam forming.
LMS algorithm and its applications, learning characteristics and convergence behavior, misadjustment, Normalized LMS and affine projection adaptive filters, Frequency domain block LMS algorithm.

Module II
Least squares estimation problem and normal equations, projection operator, exponentially weighted RLS algorithm, convergence properties of RLS algorithm; Kalman filter as the basis for RLS filter, Square-root adaptive filtering and QR-RLS algorithm, Systolic-array implementation of QR–RLS algorithm.

Module III
Forward and backward linear prediction - Levinson-Durbin algorithm, Lattice predictors, gradient-adaptive lattice filtering, least-squares lattice predictor, QR-decomposition based least-squares lattice filters.

Text Books:

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% Problem, derivation and Proof)
Module I

Module II

Module III
Image Segmentation and Representation: The detection of discontinuities - Point, Line and Edge detections - Gradient operators - combined detection - Thresholding - Representation schemes: chain codes - Polygon approximation - Boundary descriptors: Simple descriptors - Shape numbers Fourier descriptor's - Introduction to recognition and Interpretation.
Mathematical morphology - binary morphology, dilation, erosion, opening and closing, duality relations, gray scale morphology.

Text books:

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% Problems, derivations and proofs)
Module I
Fourier and Sampling Theory - Generalized Fourier theory, Fourier transform, Short-time(windowed) Fourier transform, Time-frequency analysis, Fundamental notions of the theory of sampling.

Theory of Frames - Bases, Resolution of unity, Definition of frames, Geometrical considerations and the general notion of a frame, Frame projector, Example – windowed Fourier frames.

Wavelets - The basic functions, Specifications, Admissibility conditions, Continuous wavelet transform (CWT), Discrete wavelet transform (DWT).

Module II
The multiresolution analysis (MRA) of L2(R) - The MRA axioms, Construction of an MRA from scaling functions - The dilation equation and the wavelet equation, Compactly supported orthonormal wavelet bases - Necessary and sufficient conditions for orthonormality.

Wavelet transform - Wavelet decomposition and reconstruction of functions in L2(R). Fast wavelet transform algorithms - Relation to filter banks, Wavelet packets.

Module III
Wavelet Transform Applications:
Image processing - Compression, Denoising, Edge detection and Object detection.
Audio - Perceptual coding of digital audio.
Wavelet applications in Channel coding.

References:
1. P. P. Vaidyanathan: Multirate Systems & Filter Banks, PTR, PH, 1993
2. Gilbert Strang: Linear Algebra and its Applications.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% problems, derivations and proof)

Assignment for Sessional marks shall be problems based on MATLAB / any other software packages covering the syllabus above.
08.646 DIGITAL SIGNAL PROCESSORS (TA)
L-T-P : 2-1-0
Credits: 3

Module I
Introduction to programmable digital signal processors: Multiplier and multiplier accumulator, Bus structure, multiple access memories, VLIW architecture, enhancing computational throughput - parallelism and pipelining, special addressing modes, on chip peripherals. Architecture of TMS320C5x: Bus structure, CALU, ARAU, registers, parallel logic unit, program controllers, flags, on chip memory, and peripherals.

Module II
Assembly language instructions: Assembly language syntax, addressing modes, load/store instructions, add, subtract, multiply, NORM and program control instructions. Instruction pipelining in C5x: pipeline structure, pipeline operation, program for familiarization of arithmetic instructions, programs for processing real time signals. Systolic architecture introduction-systolic array design-FIR systolic arrays- selection of scheduling vector- matrix multiplication and 2D systolic array design- systolic design for space representations containing delays.

Module III
Fast Convolution- cook toom algorithm and winogard algorithm. iterated convolution, cyclic convolution. Computer arithmetic- Signed Digit Numbers(SD) - Multiplier Adder Graph - Logarithmic and Residue Number System(LNS, RNS) - Index Multiplier -Architecture for Pipelined Adder, Modulo Adder & Distributed Arithmetic(DA), CORDIC Algorithm and Architecture. Square rooting:- digit recurrence algorithm.

References:
3. Digital Signal processing with FPGAs, U Mayer Baese, 2e, Springer
5. Texas Instruments TMSC5x, Users Manuals.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 25% Problems and algorithms)
Module I
Unconstrained optimization - Necessary and sufficient conditions for local minima, One dimensional search methods, Gradient methods - Steepest descent, Inverse Hessian, Newton’s method, Conjugate direction method, Conjugate gradient algorithm, Quasi Newton methods.

Module II
Linear Programming : - Convex polyhedra, Standard form of linear programming, Basic solutions, Simplex algorithm, Matrix form of the simplex algorithm, Duality, Non simplex methods : Khachiyan method, Karmarkar’s method.

Module III
Genetic Algorithms - basics, design issues, convergence rate, Genetic Algorithm methods.

Text Books:
EDWIN K. P. CHONG, STANISLAW H. ZAK, An Introduction to Optimization,2/e, John Wiley & Sons.

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% Problems, derivations and proofs)
Module I
Review of vector geometry – Spherical and cylindrical coordinate systems- Maxwell's equations, TEM modes in a linear homogenous isotropic medium, polarization, Pointing vector and power flow, TEM waves incident on a boundary - Snell's laws, wave propagation inside a conductor - skin depth, weakly dispersive TEM modes - phase and group velocity.

Module II
Multi-conductor Transmission Lines - Time-domain analysis of transmission lines, Bounce diagrams, Frequency-domain analysis of transmission lines, Standing waves; Smith chart, Transmission line matching, Single stub matching, quarter-wave transformers.
Waveguides - Electromagnetic fields in parallel-plate, rectangular waveguides, TE and TM modes, wave impedance, wave velocities, attenuation in waveguides.

Module III
Electromagnetic radiation, retarded potentials, power density, beam solid angle, radiation intensity, radiation resistance, radiation pattern, radiation efficiency, gain, directivity, effective aperture and effective length of the antennas. Electric field, magnetic field, radiation resistance and directivity of short dipole and half wave dipole. Folded dipole, Yagi Uda, Parabolic dish antenna. Antenna arrays – broadside and end-fire array.
Wave Propagation – Ground wave, Sky wave and Space wave propagation.

Text Book:

Reference:
5. David K. Cheng, Field and Wave Electromagnetics, 2/e, Pearson Education.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% Problems, derivations and proofs)
08.607 MICROCONTROLLER LAB (TA)

L-T- : 0-0-4

Credits: 4

Programming experiments using 8051 Trainer Kit.

Addition and Subtraction of 16 bit numbers.
Multiplication and division of 8 bit numbers.
Sorting, Factorial of a number.
Multiplication by shift and add method.
LCM and HCF of two 8 bit numbers
Matrix addition
Square, Square root, Fibonacci series.

B. Interfacing experiments

1. DAC interface.
2. Stepper motor interface.
3. Display interface.
4. Realization of Boolean expression using port.
5. Frequency measurement by counting the number of pulses in a fixed amount of time.
6. Frequency measurement by measuring the time period between two consecutive pulses.
7. Waveform generation using lookup tables.
8. PWM generation.
9. Interfacing with 8-bit ADC.

Note: For University examination, the following guidelines should be followed regarding award of marks:
(Questions for each batch should be selected equally from part A and B)

(a) Circuit and design - 20%
(b) Implementation(Usage of Kits and trouble shooting) - 15%
(c) Result - 35%
(d) Viva voce - 25%
(e) Record - 05%

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.
This course includes both theory and practical works

I. THEORY
Theory classes are to be conducted 1 hour/week, based on the following syllabus:

DESIGN (Theory only)

Text Books:

II. PRACTICAL
A) COMPUTER AIDED PCB DESIGN & ASSEMBLING
One hour per week is allotted for Computer Aided PCB Design & Assembling.
Following Circuits are to be used for the above purpose (Minimum one circuit from each category should be done)
- Discrete component circuits.
- Timer ICs based circuits.
- Op-Amp ICs based circuits.
- Digital ICs based circuits.
- Microcontroller based circuits.
- Combination of the above.

B) MINIPROJECT
For Miniproject, 2 hours/week is allotted.
Each student should conceive, design develop and realize an electronic product. The basic elements of product design - the function ergonomics and aesthetics - should be considered while conceiving and designing the product. The electronic part of the product should be an application of the analog & digital systems covered up to the 6th semester. The realization of the product should include design and fabrication of PCB. The student should submit a soft bound report at the end of the semester. The product should be demonstrated at the time of examination.

Internal Evaluation & Marks
Total internal marks is 50.
An end semester written examination is to be conducted based on the Theory part (Design), with two hour duration for 25 Marks. Remaining 25 marks is to be awarded for the Mini project, after evaluation at the end of the semester.
University Examination & Marks
Total external marks are 100.
Practical examination will be conducted for Computer Aided PCB Design (1 1/2 hour) & PCB Assembling (1 1/2 hour). The miniproject will also be evaluated during the practical examination. One of the following custom made PCB may be used for the University examination.
Water Level Controller.
Water Level Indicator.
Musical Burglar Alarm.
Light Dimmer.
Heat Sensor.
FM Transmitter.
Dancing Light.
Audio Level Indicator.
Clap Switch/Sound Operated Switch.
Touch Sensitive Switch.
Audio Power Amplifier.
Regulated Power Supply (Rectifier-Filter-Regulator)
Count Down Timer.
Digital Clock.
Musical Door Bell.

Note: For University examination, the following guidelines should be followed regarding award of marks

(a) PCB Design (any given circuit using CAD software) - 20%
(b) PCB assembling of the given circuit on a single sided given PCB - 10%
(c) Result/working of the assembled circuit - 15%
(d) Evaluation of the finished Mini project done by the student - 20%
(e) Viva voce (Based only on the Mini Project done by the student) - 25%
(f) Record & Report - (5+5)%

Students shall be allowed for the University examination only on submitting the duly certified record and the mini project report (Soft bounded). The external examiner shall endorse them.
Syllabus VII Semester

08.701 INDUSTRIAL MANAGEMENT (TA)

L-T-P : 2-1-0  

Credits: 3

Module I
Cost concept - Break even analysis (simple problems). Depreciation - Methods of calculating depreciation. Introduction to reliability. Reliability of electronic components

Module II
Facilities Planning- Factors to be considered in site selection, plant layout- types of layout, layout planning- systematic layout planning, computerized planning techniques.
Introduction to Material Handling Principles, equipments and their selection

Module III
Fatigue and methods of eliminating fatigue- industrial relations - Industrial disputes- collective bargaining – Trade unions- workers participation in management in Indian context.
Labour welfare and social security- Industrial safety – Methods and Techniques.
Production Planning and Control - functions and Objectives- job, batch, mass and continuous production – Inventory control- Determination of EOQ-selective inventory control techniques.
Quality Engineering :– Quality Control- Quality Vs Cost concept, Control chart for variables and attributes- Introduction to Six Sigma- Introduction to ISO, Total Quality Management, Quality information system, Bench marking and Quality circles
Introduction to Marketing and its Environment- different concepts- marketing mix-Product Life Cycle.

References:
2. Grant and levenworth, Statistical Quality Control, TMH.
4. Introduction to Work Study- ILO
5. Besterfield, Total Quality management, Pearson Education
7. Kotler, Marketing Management, Pearson Education
9. Monappa, Industrial Relations, TMH

University Examination
Question Paper consists of two parts. Part A-10 compulsory short answer questions for 4 marks each, covering the entire syllabus (10 x 4=40). Part B-2 questions of 20 marks each, from each module and student has to answer one from each module (3 x 20=60)

Note: 08.701 shall be handled by faculty of Mechanical Dept.
Module I
Introduction - Basic concepts, definition and origin of robotics, different types of robots, robot classification, applications, robot specifications. Introduction to automation - Components and subsystems, basic building block of automation, manipulator arms, wrists and end-effectors. Transmission elements: Hydraulic, pneumatic and electric drives. Gears, sensors, materials, user interface, machine vision, implications for robot design, controllers.

Module II
Kinematics, dynamics and control - Object location, three dimensional transformation matrices, inverse transformation, kinematics and path planning, Jacobian work envelope, manipulator dynamics, dynamic stabilization, position control and force control, present industrial robot control schemes. Robot programming - Robot programming languages and systems, levels of programming robots, problems peculiar to robot programming, control of industrial robots using PLCs.

Module III

Text Books:

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 50% Problem, derivation and Proof)
Module I

Module II

Module III

Text Books:

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% Problem, derivation and Proof)
Module I

Module II

Module III

Text Books:
1. George Stephenopoulos: Chemical Process Control, 2/e, PHI.

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% Problem, derivation and Proof)
08.705  REAL TIME OPERATING SYSTEMS (TA)

L-T-P : 2-1-0  

Module I
Introduction to Operating system-:Kernel, Process- states and transition- manipulation of process and address space, creation and termination, signals, process scheduling. memory management
Interrupts: interrupt sources and handlers- saving and restoring the content, disabling interrupt, the shared data problem- shared data bug- atomic and critical section- interrupt latency.
Structure of real time systems: task classes, time systems and classes, performance measures.

Module II
RTOS: tasks, threads and process- reentrancy- reentrancy rules- RTOS semaphores-semaphore initialization-semaphore reentrancy, multiple semaphore
RTOS services: message queue- mailboxes and pipes - time function -events -memory management - interrupt routine in RTOS.
Scheduling- Rate monitoring Scheduling- Deadline monitoring scheduling. Aperiodic Task Scheduling: Non-preemptive methods (EDD, LDF), Preemptive methods (EDF, EDF). Periodic Task Scheduling: Static priority assignments (RM, DM), Dynamic priority assignments (EDF, EDF*)

Module III
Real time kernels- issues in real time kernel-Structure of a real-time kernel-Process states -Data structures-Kernel primitives -Inter-task communication mechanisms -System overhead.
Case study of( Kernel design, threads and task scheduling) RTOS: QNX Nutrino2 and MicroC/OS-II real time operating systems.

Text Books:

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
Module I
Introduction to cryptology- stream and block ciphers- secret and public key cryptography.
Mathematical Proof Methods: direct, indirect, by cases, contrapositive, contradiction, induction, existence.
Introduction to Complexity of Algorithm- P, NP, NP-Complete classes.
Number theory- primes, divisibility, linear diophantine equations, congruences, system of linear congruences, Wilson theorem, Fermat’s little theorem, Euler’s theorem. Multiplicative functions, Primitive roots, Quadratic congruences- quadratic residues, Legendre symbol. Review of algebraic structures- groups, rings, finite fields, polynomial rings over finite field.

Module II
Affine cipher, Hill cipher, Enciphering matrices.

Module III
Cryptanalysis methods- linear, differential, higher order differential, quadratic. Factoring Algorithms- Trial Division, Dixon’s Algorithm, Quadratic Sieve.

Reference:
2. Thomas Koshy: Elementary Number Theory with Applications, Elsevier India, 2e.

Reading:
2. Niven, Zuckerman: An Introduction to Theory of Numbers, Wiley InterScience.
4. Mao: Modern Cryptography, Pearson Education.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. 
(Minimum 60% Problem, derivation, algorithms and Proof)
Module I
Parameter estimation methods - Maximum-Likelihood estimation, Gaussian mixture models, Expectation-maximization method, Bayesian estimation.

Module II
Non-parametric techniques for density estimation - Parzen-window method, K-Nearest Neighbour method.

Module III
Linear discriminant function based classifiers – Perceptron, Support vector machines.
Non-metric methods for pattern classification - Non-numeric data or nominal data, Decision trees, Cluster validation.

Text Books:

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problem, derivation, Proof and algorithms)
08.735 OPTOELECTRONIC DEVICES (TA)

Module I
Optical processes in semiconductors, EHP formation and recombination, absorption and radiation in semiconductor, deep level transitions, Auger recombination, luminescence and time resolved photoluminescence, optical properties of photonic band-gap materials. Measurement of optical properties

Module II
Photovoltaic effect, V-I characteristics and spectral response of solar cells, heterojunction and cascaded solar cells, Schottky barrier and thin film solar cells, design of solar cell.
Modulated barrier, MS and MSM photodiodes; Wavelength selective detection, coherent detection; Micro cavity photodiode.
Electroluminescent process, choice of light emitting diode (LED) material, device configuration and efficiency; LED: Principle of operation, LED structure, frequency response, defects, and reliability. Principle of Optoelectronic modulators, electro optic modulator, acousto-optic modulators. Application area

Module III
Junction Laser - Operating principle, threshold current, heterojunction lasers, DFB laser, Cleaved Coupled Cavity laser, Quantum Well lasers, Surface emitting lasers, Rare-earth doped lasers, Alternate Pumping techniques. Mode Locking of semiconductor lasers, Tunneling Based lasers, FP lasers

References
1. Pallab Bhattacharya: *Semiconductor Optoelectronic devices*, 2/e, PHI.
2. John M. Senior: *Optical Fiber Communications – Principles and Practice*, 2/e, PHI.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 50% problems, derivations and proof)
Module I
Introduction- The Marr paradigm and scene reconstruction, Other paradigms for image analysis.
Image Formation- Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Image Digitization.
Binary Image Analysis and Segmentation- Properties, Digital geometry, Segmentation.

Module II
Image Processing for Feature Detection and Image Synthesis- Image representations in continuous and discrete form, Edge detection, corner detection, Line and curve detection, SIFT operator, Image-based modeling and rendering, Mosaics, snakes, Fourier and wavelet descriptors, Multiresolution analysis.
Shape from X - Shape from shading, Photometric stereo, Texture, Occluding contour detection.

Module III
Motion Analysis- Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.
Object Recognition- Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, Shape priors for recognition.

Text Book:

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 60% Problem, derivation and Proof)
Module I
Historical Perspective, Generic Principles-Modality, Contrast, SNR, Resolution, Toxicity.
Mathematical fundamentals- 2D Fourier Transform, Hankel Transform, Radon Transform, k-space.
Physics of Projection Radiography.
Computerized Tomography-Principles of sectional imaging - Scanner configuration - Data acquisition system - Image formation principles - Conversion of x-ray data in to scan image - 2D image reconstruction techniques - Iteration and Fourier methods-Types of CT scanners-Applications.

Module II

Module III
Magnetic Resonance Imaging - Physics of MRI - Pulse sequence- Image acquisition and reconstruction techniques- MRI instrumentation- Magnets-Gradient system- RF coils - Receiver system-Functional MRI -MRI Angiography- Applications of MRI.

Text books:

References :

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 25% Problem, derivation and Proof)
08.706 MIXED SIGNAL CIRCUIT DESIGN (TA)
L-T-P : 2-1-0
Credits: 3

Module I
Analog and digital MOSFET models. CMOS inverter – DC characteristics – switching characteristics, Static logic gates- NAND and NOR gates- DC and Switching characteristics-pass transistor and transmission gate logic.

Module II

Module III
Dynamic analog circuits – charge injection and capacitive feed through in MOS switch – sample and hold circuits- Design of Switched capacitor circuits – First order switched capacitor circuits, capacitor filters- Design of PLL, Sense amplifiers, DAC, ADC – High speed ADC, Over sampling ADC

Text Book:

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 75% Design, Analysis and Problems)
Module I

Introduction to Embedded Systems
Definition and Classification – Overview of Processors and hardware units in an embedded system – Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits
I/O Devices - Device I/O Types and Examples – Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports - Timer and Counting
Devices - ‘12C’, ‘USB’, ‘CAN’ and advanced I/O Serial high speed buses- ISA, PCI, PCI-X.

Module II

Programming concepts of Embedded programming in C  Program Elements, Macros and functions - Use of Pointers - NULL Pointers - Use of Function Calls – Multiple function calls in a Cyclic Order in the Main Function Pointers – Function Queues and Interrupt Service Routines Queues Pointers – Concepts of embedded programming in C++ – Cross compiler – Optimization of memory codes.

Module III

I/O Subsystems – Interrupt Routines Handling in RTOS, RTOS Task scheduling models - Handling of task scheduling and latency and deadlines as performance metrics – Co-operative Round Robin Scheduling – Cyclic Scheduling with Time Slicing (Rate Monotonics Co-operative Scheduling) – Preemptive Scheduling Model strategy by a Scheduler - Inter Process Communication and Synchronisation – Shared data problem – Use of Semaphore(s) – Priority Inversion Problem and Deadlock Situations – Inter Process Communications using Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual (Logical) Sockets – Remote Procedure Calls (RPCs).
Study of Micro C/OS-II or Vx Works or Any other popular RTOS – RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions .

REFERENCES

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
Module I

Module II
Patents- Meaning and purpose of patent, advantage of patent to inventor, invention not patentable, application for patent, provision for secrecy of certain inventions, grant of Patent, rights of patent holder, infringement of patent, offences and penalties, international arrangements. Copyrights- introduction, meaning of copyrights ownership, rights of owner, subject matter of copyrights, international copyrights, infringement, offences and penalties. Industrial design- Introduction, registration of design, copyrights in registered design Industrial and international exhibitions.

Module III
Semiconductor IC layout design- Introduction, condition and procedure for registration, Effects of registration, offences and penalties. IT related IPR-Computer software and IPR, database and protection, domain name protection. International treaties- Introduction, TRIPS, PCT, WIPO, EPO, WTO, introduction to dispute settlement procedure, Indian position in global IPR structure.

References
2. Ganguli, Intellectual property rights, TMH, Delhi

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
Module I
Scaling laws in miniaturization - scaling in geometry, scaling in rigid body dynamics, the trimmer force scaling vector, scaling in electrostatic and electromagnetic forces, scaling in electricity and fluidic dynamics, scaling in heat conducting and heat convection.

Module II

Module III

Text book:

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
Module I
Introduction- Need for low power VLSI chips, Sources of power dissipation, Dynamic power dissipation, Charging and discharging of capacitance, Short circuit current in CMOS circuits, CMOS leakage current, Static current.
Power analysis - Gate-Level, Architecture level and Data correlation analysis. Monte Carlo Simulation. Probabilistic power analysis.
Low voltage CMOS VLSI technology - BiCMOS and SOI CMOS technology.

Module II
Power reduction at the circuit level - Transistor and gate sizing, Equivalent pin ordering, Network restructuring and reorganization, Special latches and Flip Flops, Low power digital cell library, Adjustable device threshold voltage-Low voltage circuits-voltage scaling-sub threshold operation of MOSFETs.
Power reduction at the logic level - Gate reorganization, Signal gating, Logic encoding, State machine encoding, Precomputation logic.

Module III
Power reduction at the architecture and system level - Power and performance management, Switching activity reduction, Parallel architecture with voltage reduction, Flow graph transformation.
Low power SRAM architectures. Software design for low power architecture. Recent trends in low-power design for mobile and embedded application.

Text books:

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 40% Problem, derivation and Proof)
08.756 MECHATRONICS (A)
L-T-P : 2-1-0
Credits: 3

Module I
Introduction to mechatronics - mechatronics in manufacturing - mechatronics in products - scope of mechatronics - fundamentals of numerical control - advantages of NC systems - classification of NC systems - point to point and contouring systems - NC and CNC - incremental and absolute systems - open loop and closed loop systems - features of NC machine tools - fundamentals of machining - design consideration of NC machine tools - methods of improving machine accuracy and productivity - special tool holders.

Module II

Module III

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 25% Problems, derivations and proofs)

Module IV (This Module is only for internal evaluation – 25 Marks as assignment for the subject)
PART A:
2. PC based respiratory analyser.
3. PC based ECG, pulse analyser.
4. Audio tone analyser.
5. Blood pressure calibrator.

**Experiments on Digital Signal Processors.**
6. Sine wave generation (Display on CRO)
7. Real Time FIR Filter implementation (Low-pass, High-pass and Band-pass)
8. Real Time IIR Filter Implementation (Low-pass, High-pass and Band-pass)
9. Real time DFT of sine wave (Display on CRO)
10. Sampling a given Analog signal and study of aliasing.

PART B:
**Experiments on MATLAB or LABVIEW**
1. Convolution : Linear Convolution, Circular Convolution, Linear Convolution using Circular Convolution.
2. Random Sequence Generation: Uniform, Rayleigh and Normal Distributions
3. Discrete Fourier Transform: (Unfolding the spectrum, Frequency Unwrapping)
4. Linear convolution using DFT (Overlap-add and Overlap-Save methods).
5. Design & implementation of IIR filters. (Butterworth and Chebyshev Filters)
6. Design & implementation of FIR filters. (Window method and Frequency sampling Method)
9. Study of Sampling rate conversion by a rational factor
10. Study of Coefficient Quantization effects on the frequency response of digital filter.

**Internal Marks: 50**
1. Attendance - 10
2. Class work - 20
3. Practical internal test - 20

**Note:** For University examination, the following guidelines should be followed regarding award of marks:
(Questions for each batch should be selected equally from part A and B)

(a) Circuit and design - 20% (Logical design and flow diagram for software Expts.)
(b) Implementation(Wiring, usage of equipments and trouble shooting) - 15% (Coding for Software Expts.)
(c) Result - 35% (Including debugging of Program for Software Expts.)
(d) Viva voce - 25%
(e) Record - 05%

Practical examination to be conducted covering entire syllabus given above.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.
08.708 CONTROL SYSTEM LAB (A)

L-T-P : 0-0-3

Credits: 3

PART -A

1. Frequency response characteristics of a second order system
2. Time response characteristics of a second order system
4. Design of compensation networks (Lead, Lag and Lag –level)
5. Design of state feedback
6. Observer design
7. Implementation of digital PID in a PC using c language and ADC/DAC
8. Data acquisition using LabVIEW
9. PID controller using LabVIEW

PART-B

Experiments based on MATLAB/LABVIEW

1. Microprocessor based servo system.
2. Speed control system (Open loop & closed loop)
3. Real time control of inverted pendulum
4. Real time control of gyroscope.
5. Ball beam system
6. Position control system with velocity feedback
7. Analog PID controller.

Internal Marks: 50
1. Attendance - 10
2. Class work - 20 (For Part A only)
3. Practical internal Test - 20 (For Part B only)

Note: For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design - 20%
(b) Performance (Wiring, usage of equipments and trouble shooting) - 15%
(c) Result - 35%
(d) Viva voce (Including Part-B also) - 25%
(e) Record - 05%

Practical examination (university) to be conducted covering entire syllabus given above in part-A.

Students shall be allowed for the University examination only on submitting the duly certified record (Including Part-A and Part-B). The external examiner shall endorse the record.
08.709 SEMINAR (TA)

L-T-P : 0-0-1

Credits: 1

Internal Evaluation (50 Marks)

The student is expected to present a seminar in one of the current topics in Electronics, Communication, Electronic Instrumentation and related areas based on current publications.

The student will undertake a detailed study on the chosen subject and submit a seminar report in a soft bound form at the end of the semester. This report shall be submitted for evaluation for the viva-voce in 8th semester.

The report shall be endorsed by the Guide, Seminar coordinator and the Professor/HOD.
Evaluation of presentation will be conducted by a committee of the Seminar coordinator, Guide and a Senior faculty.

Internal Marks shall be awarded as follows:

1. Evaluation of Presentation : 30 marks
2. Evaluation of Report : 20 marks
08.710 PROJECT DESIGN (TA)

L-T-P : 0-1-0

Credits: 1

Internal Evaluation (50 Marks)

The student is expected to select a project in one of the current topics in Electronics, Communication, Electronic Instrumentation and related areas based on current publications.

He/She shall complete the design of the project work and submit the design phase report. This shall be in soft bound form.

This report shall be submitted for evaluation in 7th semester as well as for the viva-voce in 8th semester.

The report shall be endorsed by the Guide, Project co-ordinator and the Professor/HOD.

Evaluation of report and viva will be conducted by a committee consisting of the Project co-ordinator, Guide and a Senior faculty.

The number of students in a project batch shall be limited to a maximum of four.
(The project shall be done in the Institute where the student is doing the course)

Internal Marks shall be awarded as follows:
Evaluation of the report : 25 marks
Viva : 25 marks
Syllabus VIII Semester

08.801  NANO ELECTRONICS (TA)

L-T-P : 2-1-0  Credits: 3

Module I

Introduction to nanotechnology and nanoelectronics, Impacts, Limitations of conventional microelectronics. Introduction to methods of fabrication of nanomaterials-different approaches. Fabrication of nano-layers - Physical Vapor Deposition, Chemical Vapor Deposition, Epitaxy, Molecular Beam Epitaxy, Ion Implantation, Formation of Silicon Dioxide. Fabrication of nanoparticle- grinding with iron balls, laser ablation, reduction methods, sol gel, self assembly, precipitation of quantum dots.

Introduction to characterization tools of nano materials- - principle of operation of STM, AFM, SEM, TEM, XRD, PL & UV instruments.

Module II

Mesoscopic Physics and Nanotechnologies - trends in Microelectronics and Optoelectronics, characteristic lengths in mesoscopic systems, Quantum mechanical coherence, Quantum wells, wires and dots, Density of states and dimensionality

The physics of low dimensional structures - basic properties of two dimensional semiconductor nanostructures, square quantum wells of finite depth, parabolic and triangular quantum wells, quantum wires and quantum dots

Semiconductor quantum nanostructures and super lattices - MOSFET structures, Heterojunctions, Quantum wells, modulation doped quantum wells, multiple quantum wells

The concept of super lattices Kronig - Penney model of super lattice.

Transport of charge in Nanostructures under Electric field - parallel transport, perpendicular transport, quantum transport

Transport of charge in magnetic field and quantum Hall effect - Effect of magnetic field on a crystal, the Aharonov-Bohm effect, the Shubnikov-de Hass effect, the quantum Hall effect.

Module III

Nanoelectronic devices and systems - MODFETS, heterojunction bipolar transistors, resonant tunnel effect, RTD, RTT, hot electron transistors, Coulomb blockade effect and single electron transistor, CNT transistors, heterostructure semiconductor laser, quantum well laser, quantum dot LED, quantum dot laser, vertical cavity surface emitting laser, quantum well optical modulator, quantum well sub band photo detectors, Infrared detector, nanoswitches, principle of NEMS.

Text Books


W.R. Fahrner, Nanotechnology and Nanoelectronics, Springer, 2005

References


Poole, Introduction to Nanotechnology, John Wiley 2006

Chattopadhyay, Banerjee, Introduction to Nanoscience & Technology, PHI 2009

Diwanand and Bharadwaj, Nanoelectronics, Pentagon Press Delhi 2006

Question Paper

The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. (Minimum 25% Problems)
08.802 NON-LINEAR CONTROL THEORY (A)
L-T-P : 3-1-0

Credits: 4

Module I

Module II

Module III
Adaptive and Feedback Linearization - Matching and triangular conditions, Robust stabilization, self tuning regulator, adaptive feedback Linearization, extension to multi input systems, physical examples.

Text books:

REFERENCE
1. Peter A. Cook, Non-linear Dynamical Systems, 3/e, Pearson Education.

Question Paper
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(Minimum 60% Problem, derivation and Proof)
08.803 SMART SENSORS & NETWORKS (A)

L-T-P : 2-1-0

Credits: 3

Module I
Review: Sensor, actuator and transducer- Classification of sensors on the basis of energy source and type of output signals. Signal conditioning. Meaning and types of smart sensors.

Module II
Intelligent and Network Sensors: Concept and architecture of intelligent sensors, Concept and architecture of network sensors.

Module III

Text Books:

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
08.804 INDUSTRIAL INSTRUMENTATION (A)
L-T-P : 3-1-0
Credits: 4

Module I

Module II

Module III

Text books:
2. D. Patranabis, Principles of Industrial Instrumentation, 2/e, TMH.

References:
3. Willard, Merritt, Dean and Settle, Instrumental Methods of Analysis, 7/e, CBS Publishers, India.

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.

(Minimum 25% Problem, derivation and Proof)
08.805 DISTRIBUTED CONTROL SYSTEMS (A)

L-T-P : 2-1-0  Credits: 3

Module I
Programmable logic controller (PLC) basics: Definition, overview of PLC systems, input/output modules, power supplies and isolators. General PLC programming procedures, programming on-off inputs/outputs. Auxiliary commands and functions, PLC Basic Functions, register basics, timer functions, counter functions. PLC functions: Arithmetic functions, comparison functions, Skip and MCR functions, data move systems. PLC Advanced intermediate functions: Utilizing digital bits, sequencer functions, matrix functions.

Module II
PLC Advanced functions: Alternate programming languages, analog PLC operation, networking of PLC, PLC-PID functions, PLC installation, troubleshooting and maintenance. Design of interlocks and alarms using PLC.
DCS- Basic Packages Introduction, analog control, direct digital control, distributed process control, DCS configuration with associated accessories, control console equipment, control unit (Relay Rack mounted equipments), local control units, attributes of DCS & DCS Flow sheet symbols. DCS System Integration I/O hardware stations, Set-point station control, Supervisory Computer Tasks & configurations, system integration with PLCs and computers.

Module III
Instrumentation Standard Protocols: HART Protocol, frame structure, programming, implementation examples, Benefits, Introduction, Advantages and Limitations of Fieldbus, FDS configuration, Comparison with other fieldbus standards including Device net, Profibus, Controlnet, CAN, Industrial Ethernet, MAP and TOP.
Industrial applications of PLC, SCADA, DCS and open systems for following plants: Cement plant, Thermal power plant, Steel Plant, Glass manufacturing plant, Paper and Pulp plant.

Text Books:

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% Problems, derivations and proofs)
Module I

Module II

Module III

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% Problems, derivations and proofs)
Module I
Introduction - Some common robust control problems. Linear system tools - Jordan and Real Jordan canonical forms, structural decomposition.
Structural mapping of Bilinear Transformations - Mapping of continuous time to discrete time and vice versa, existence condition of $H_\infty$ - sub optimal controllers, continuous time system and discrete time system.

Module II
Solution to Discrete time Riccati Equations - Solutions to general DARE and $H_\infty$-DARE.
Information in continuous time and discrete time $H_\infty$ - optimization - Full information feedback case, output feedback case, plants with imaginary axis zeros/unit circle zeros.

Module III
Solutions to continuous time and discrete time $H_\infty$ problems - Full state feedback, full order output feedback, reduced order output feedback.
Robust and perfect tracking of continuous time and discrete time systems, solvability conditions and Solutions - solutions to measurement feedback case.

Text Books:

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 60% Problem, derivation and Proof)
08.835 VLSI STRUCTURES FOR SIGNAL PROCESSING(A)

L-T-P : 2-1-0  

Credits: 3

Module I

Module II
Parallel FIR filters – discrete time cosine transform – implementation of DCT based on algorithm – architecture transformations – parallel architectures for rank order filters.
Scaling and round off noise – round off noise in pipelined IIR filters – round off noise in lattice filters – pipelining of lattice IIR digital filters – low power CMOS lattice IIR filters.

Module III
Evolution of programmable DSP processors – DSP processors for mobile and wireless communications – processors for multimedia signal processing – FPGA implementation of DSP processors -Typical architecture of DSP processor in FPGA.

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 50% Problems, derivations and proofs)
Module I

Module II

Module III

Text Books:
2. N.A. Sherwani, Algorithms for VLSI Physical Design Automation, 3/e, BSP, India. 

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.  
(Minimum 50% Algorithms and design problems)
Module I

Module II

Module III

Text Books:

References:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. (Minimum 50% Problem, derivation and Proof)
08.816 REVERSIBLE LOGIC DESIGN (A)  
C r e d i t s : 3

Module I

Module II

Module III

Text Books:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. 
(Mi n i m um 5 0 % Pr o b l e m , d e r i v a t i o n a n d P r o o f)
Module I

Module II
Induction Motor Drives: Induction Motor equivalent circuit, Block diagram and transfer function, Speed control by varying stator frequency and voltage, Principle of vector control, Comparison of vector control and scalar control, Voltage source inverter driven induction motor. Synchronous Motor Drives: Basic principles of synchronous motor operation and its equivalent circuit, Methods of control.

Module III
Application of PWM in control of DC-DC converters and DC-AC, Classification of PWM, Quasi square wave PWM, Frequency spectrum of PWM signals, Sinusoidal PWM, Space vector PWM, Comparison of SPWM and SVPWM, Selective harmonic elimination PWM, Hysteresis controller.

Text Books:

Reference:

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered. (Minimum 50% Problems and design)
Module I
Virtual Instrumentation - Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, HMI / SCADA software, Active X programming.
VI programming techniques - VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

Module II
Data acquisition basics - Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements. VI Chassis requirements.
Common Instrument Interfaces - Current loop, RS 232C/RS485, GPIB.
Bus Interfaces - USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI.

Module III
Networking basics for office & Industrial applications. VISA and IVI. VI toolsets. Distributed I/O modules.
Application of Virtual Instrumentation - Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Industrial Communication, Image acquisition and processing, Motion control.

Text Books:

Reference Books:

Web Resources:
1. www.ni.com
2. www.ltrpub.com

Question Paper
The question paper shall consist of two parts. Part I is to cover the entire syllabus, and carries 40 marks. This shall contain 10 compulsory questions of 4 marks each. Part II is to cover 3 modules, and carries 60 marks. There shall be 3 questions from each module (10 marks each) out of which 2 are to be answered.
(Minimum 25% Problems, derivations and proofs)
08.846 CURRENT TOPICS (A)

L-T-P : 2-1-0

Credits: 3

The syllabus shall contain current area of research in Applied Electronics & Instrumentation (45hrs.) which shall meet the pattern of the elective subjects given in the eighth semester.

It shall not be a repetition of any subject or contents of a subject in the syllabus given.

The syllabus shall be approved by the Board of Studies of the University before the commencement of semester.
1. Experimental study of P, PD, PI and PID controllers on level, flow, temperature and pressure loops.
2. Experimental study of ON-OFF controller and ON-OFF controller with neutral zone on temperature control systems.
3. Controller tuning using continuous cycling method.
4. Controller tuning using process reaction curve method.
5. Control valve characteristics.
6. Experimental study of Ratio, Cascade and Feed forward control systems.
7. PLC based Water level, Bottle filling and Motor speed control systems.
8. Calibration of pressure gauge.
9. Design and testing of RTD based temperature transmitter.
10. Experimental study of Inertial control systems.
11. Experimental study of Binary distillation process.

Internal Marks: 50
1. Attendance - 10
2. Class work - 20
3. Practical internal Test - 20

Note: For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design - 20%
(b) Performance (Wiring, usage of equipments and trouble shooting) - 15%
(c) Result - 35%
(d) Viva voce - 25%
(e) Record - 05%

Practical examination to be conducted covering entire syllabus given above. Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.
Each student shall complete the project work assigned to him/her and submit the project report by the end of the semester.

This report (consisting of problem statement, design, implementation, results and analysis) shall be of a hard bound type.

The report shall be endorsed by the Guide, Project co-ordinator and the Professor/HOD.

Evaluation of report, results, presentation and viva will be conducted by a committee consisting of the Project co-ordinator, Guide and a senior faculty.

The number of students in a project batch shall be limited to a maximum of four.

(The project shall be done in the Institute where the student is doing the course)

Marks shall be awarded as follows:
1. Mid semester evaluation by the committee - 50 Marks.
2. End semester evaluation & Viva by the committee - 50 Marks.
VIVA-VOCE (TA)

University Examination only (100 Marks)
Minimum pass mark is 40.

(Examiners shall be faculty members having minimum of five years teaching experience)

Viva-Voce examination shall be based only on the subjects studied in the course.
Students shall submit the following while attending the viva-voce:

1. Seminar Report (Certified during 7th Semester)
2. Project Design Report (Certified during 7th Semester)
3. Project Report (Certified during 8th Semester)

External Examiner shall endorse all the Reports.

Marks shall be awarded as follows:
1. Questions based on subjects in the course : 70 Marks
2. Questions based on Project : 20 Marks
3. Questions based on Seminar : 10 Marks

Note:
Students shall not be permitted to attend the Viva-Voce examination if he/she does not submit the certified Project reports and Seminar report to the External Examiner for endorsing.