UNIVERSITY OF KERALA

B.TECH DEGREE COURSE
(2008 SCHEME)

REGULATIONS, SCHEME AND SYLLABUS
FOR

ELECTRONICS AND COMMUNICATION 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 semester 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>
</tbody>
</table>
| Project Work       |            |       | Work Assessed by Guide – 50%  
|                    |            |       | Assessed by a three member committee out of which one member is the guide – 50%  

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</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%</td>
<td>F</td>
<td>0</td>
<td>Failed</td>
</tr>
<tr>
<td>for U.E only</td>
<td></td>
<td></td>
<td></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.

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

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.

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

<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>
</tr>
<tr>
<td>08.106</td>
<td>Basic Civil Engineering</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>6</td>
</tr>
<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 Engineering</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>08.109</td>
<td>Basic Communication &amp; Information Engineering</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>6</td>
</tr>
<tr>
<td>08.110</td>
<td>Engineering Workshops</td>
<td>- - 2</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
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<td><strong>TOTAL</strong></td>
<td><strong>17 8 4</strong></td>
<td><strong>500</strong></td>
<td></td>
<td></td>
<td><strong>1000</strong></td>
<td><strong>58</strong></td>
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**TOTAL MARKS 1500**  **TOTAL CREDITS 58**

**Note:** 08.109 Subject shall be handled by the faculty of Electronics & Communication Dept.in the Colleges.
### BRANCH: ELECTRONICS & COMMUNICATION   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 (CMP/UNEFHBTAA)</td>
<td>3 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
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<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>Electronics Circuits I (T)</td>
<td>3 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
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<tr>
<td>08.306</td>
<td>Digital Electronics (T)</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</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>Digital Integrated Circuits Lab (T)</td>
<td>- - 3</td>
<td>50</td>
<td>3</td>
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<td>3</td>
</tr>
<tr>
<td>TOTAL</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: 08.304 shall be handled by faculty of Electronics & Communication Dept.

### BRANCH: ELECTRONICS & COMMUNICATION   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)</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>Electronics Circuits II (T)</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>08.405</td>
<td>Analog Integrated Circuits (T)</td>
<td>3 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>08.406</td>
<td>Analog Communication (T)</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>08.407</td>
<td>Electronics Circuits Lab (T)</td>
<td>- - 4</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>08.408</td>
<td>Analog Integrated Circuits Lab (T)</td>
<td>- - 4</td>
<td>50</td>
<td>3</td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>16 5 8</td>
<td>400</td>
<td>800</td>
<td>29</td>
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</table>

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

Note: 08.401 shall be handled by faculty of Mathematics Dept.
ALL ELECTIVES FROM SEMESTER V TO VIII EXCEPT 08.556 SHALL BE HANDLED BY FACULTY OF ELECTRONICS & COMMUNICATION 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>
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<tbody>
<tr>
<td>08.501</td>
<td>Engineering Mathematics IV - Complex Analysis &amp; Linear Algebra (TA)</td>
<td>3 1 -</td>
<td>50</td>
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<tr>
<td>08.502</td>
<td>Digital Signal Processing (TA)</td>
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<tr>
<td>08.503</td>
<td>Computer Organisation &amp; Architecture (TA)</td>
<td>2 1 -</td>
<td>50</td>
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<tr>
<td>08.504</td>
<td>Electrical Drives &amp; Control (T)</td>
<td>2 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
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<tr>
<td>08.505</td>
<td>Applied Electromagnetic Theory (T)</td>
<td>3 1 -</td>
<td>50</td>
<td>3</td>
<td>100</td>
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<tr>
<td></td>
<td>Elective I (TA) or (T)</td>
<td>2 1 -</td>
<td>50</td>
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<tr>
<td>08.507</td>
<td>Communication Engineering Lab (T)</td>
<td>- - 4</td>
<td>50</td>
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<tr>
<td>08.508</td>
<td>Digital Signal Processing Lab (T)</td>
<td>- - 4</td>
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<tr>
<td><strong>TOTAL</strong></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>
<th>Note</th>
</tr>
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<tbody>
<tr>
<td>08.506</td>
<td>Logic Synthesis &amp; Verification (TA)</td>
<td>08.501 shall be handled by faculty of Mathematics Dept.</td>
</tr>
<tr>
<td>08.516</td>
<td>Fuzzy Systems &amp; Applications (TA)</td>
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<tr>
<td>08.526</td>
<td>System Software (TA)</td>
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<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>
<td></td>
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<tr>
<td>08.556</td>
<td>Professional Communication (TA)</td>
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<tr>
<td>08.566</td>
<td>Electromagnetic Compatibility (T)</td>
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<td>Course No.</td>
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<td>Weekly load hrs</td>
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<td>-----------------</td>
</tr>
<tr>
<td>08.601</td>
<td>Microcontroller Based System Design (TA)</td>
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<tr>
<td>08.602</td>
<td>VLSI Design (TA)</td>
<td>3 1</td>
</tr>
<tr>
<td>08.603</td>
<td>Control Systems (T)</td>
<td>2 1</td>
</tr>
<tr>
<td>08.604</td>
<td>Digital Communication (T)</td>
<td>3 1</td>
</tr>
<tr>
<td>08.605</td>
<td>Antenna &amp; Wave Propagation (T)</td>
<td>2 1</td>
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<tr>
<td>08.607</td>
<td>Microcontroller Lab(TA)</td>
<td>- -</td>
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<tr>
<td>08.608</td>
<td>Electronic Product Design &amp; Mini Project (TA)</td>
<td>1 - 4</td>
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<tr>
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<td>16 6 7</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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<td>08.646</td>
<td>Digital Signal Processors (TA)</td>
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<td>08.656</td>
<td>Optimization Techniques (TA)</td>
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<td>08.666</td>
<td>Electronic Instrumentation( T )</td>
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<td>Course No.</td>
<td>Name of Subject</td>
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<tr>
<td>08.701</td>
<td>Industrial Management (TA)</td>
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<td>08.702</td>
<td>Optical Communication (T)</td>
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<td>08.703</td>
<td>Microwave Engineering (T)</td>
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<tr>
<td>08.704</td>
<td>Information Theory &amp; Coding (T)</td>
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<tr>
<td>08.705</td>
<td>Elective III (TA) or (T)</td>
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<td>08.706</td>
<td>Elective IV (TA) or (T)</td>
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<td>08.707</td>
<td>Industrial Electronics Lab (T)</td>
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<td>08.708</td>
<td>Communication Systems Lab (T)</td>
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<td>08.709</td>
<td>Seminar (TA)</td>
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<tr>
<td>08.710</td>
<td>Project Design (TA)</td>
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**TOTAL MARKS 1300**  **TOTAL CREDITS 29**

### Elective III

<table>
<thead>
<tr>
<th>Course No.</th>
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<tr>
<td>08.705</td>
<td>Real Time Operating Systems (TA)</td>
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<tr>
<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>08.755</td>
<td>CDMA Systems (T)</td>
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### Elective IV

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<th>Subject</th>
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<tr>
<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>08.726</td>
<td>Intellectual Property Rights (TA)</td>
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<td>08.736</td>
<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>Antenna Design (T)</td>
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<tr>
<td>08.801</td>
<td>Nanoelectronics (TA)</td>
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<tr>
<td>08.802</td>
<td>Radar &amp; Television Engineering (T)</td>
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<tr>
<td>08.803</td>
<td>Computer Communication (T)</td>
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<td>08.804</td>
<td>Satellite &amp; Mobile Communication (T)</td>
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<td>08.804</td>
<td>Elective V (T)</td>
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<tr>
<td>08.807</td>
<td>Microwave &amp; Optical Communication Lab (T)</td>
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<td>08.808</td>
<td>Project (TA)</td>
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**TOTAL MARKS 1300**  **TOTAL CREDITS 29**

### Elective V

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<tr>
<th>08.805</th>
<th>Aviation Electronics (T)</th>
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<tbody>
<tr>
<td>08.815</td>
<td>Integrated Optics &amp; Photonic Systems (T)</td>
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<tr>
<td>08.825</td>
<td>Microwave Devices &amp; Circuits(T)</td>
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<tr>
<td>08.835</td>
<td>Discrete Control &amp; Navigation Systems (T)</td>
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<tr>
<td>08.845</td>
<td>Artificial Intelligence and Robotics (T)</td>
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### Elective VI

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<tr>
<th>08.806</th>
<th>Modelling &amp; Simulation of Communication Systems (T)</th>
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<tr>
<td>08.816</td>
<td>Biomedical Engineering (T)</td>
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<tr>
<td>08.826</td>
<td>Information Security (T)</td>
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<td>08.836</td>
<td>Digital Instrumentation (T)</td>
</tr>
<tr>
<td>08.846</td>
<td>Current Topics (T)</td>
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</tbody>
</table>
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 shifting theorem- Solution of ordinary differential equations with constant coefficients using Laplace transforms.


MODULE-III


REFERENCES
2. Peter O’ Neil ; Advanced Engineering Mathematics, Thomson
5. Michel D Greenberg; Advanced Engineering Mathematics, Pearson International
MODULE-I

Oscillations and Waves

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. \( \mathbf{E} \) and \( \mathbf{H} \) are at right angles. Poynting’s theorem (qualitative only)

Physics of Solids

MODULE- II

Interference of Light

Diffraction of Light

Polarization of Light

Special Theory of Relativity

MODULE – III

Quantum Mechanics

Statistical Mechanics
Laser

REFERENCE:
1. Sears & Zemansky; University Physics. XI Edn., Pearson
2. Frank & Leno; Introduction to Optics. III Edn., Pearson
3. J.C. Upadhyaya; Mechanics., Ram Prasad & Sons
4. David J Griffiths; Introduction to Electrodynamics, III Edn., Pearson
7. John R Taylor, Chris D Zafiratos & Michael A Dubson; Modern Physics for Scientists and Engineers. II Edn, Prentice Hall of India
8. Eugene Hecht; Optics. IV Edn, Pearson
9. Robert Resnick ; Introduction to Special Relativity., John Willey and Sons
10. Richard L Liboff; Introduction to Quantum Mechanics. IV Edn, Pearson
11. Donald A Mcquarrie; Statistical Mechanics., Vivo Books
12. Mark Ratner& Daniel Ratner; Nanotechnology.
14. B. Premlet; Advanced Engineering Physics , Phasor Books, Kollam.

LIST OF DEMONSTRATION EXPERIMENTS
2. Air Wedge – Diameter of a thin wire
5. Laser – Diffraction at a narrow slit.
6. Laser – Diffraction at a straight wire or circular aperture.
11. 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.
MODULE-1


**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-2

**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-3

**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)
Organo electronic compounds - Super conducting and conducting organic materials like Polyaniline, polyacetylene and poly pyrrol and its applications. (2hrs)

Fuels- Calorific value- HCV and LCV- Experimental determination of calorific value- Theoretical calculation of calorific 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

1. H.A. Willard, L.L. Merrit and J.A. Dean; Instrumental methods of analysis
2. A.K. De; Environmental Chemistry
3. K.J. Klauhunde; Nanoscale materials in chemistry
4. B.R. Gowariker; Polymer science
5. B.W. Gonser; Modern materials
6. V. Raghavan; Material Science and engineering. A first course
7. L.H. Van Vlack; Elements of Material science and Engineering
8. J.W. Goodby; Chemistry of liquid crystals
9. S. Glasstone; A text book of physical chemistry
10. P.C. Jain; Engineering Chemistry
11. Juhaina Ahad; Engineering Chemistry
12. Shashi Chawla; A text book of Engineering Chemistry
14. J.C. Kuriakose and J. Rajaram; Chemistry of Engineering and Technology volume I & II
15. R.N Goyal and Harmendra Goel; Engineering Chemistry, Ane Students Edition, Thiruvananthapur
INTRODUCTION: Introduction to technical drawing and its language. Lines, lettering, dimensioning, scaling of figures, symbols and drawing instruments. (1 sheet practice)

MODULE 1
PLAIN CURVES: Conic sections by eccentricity method. Construction of ellipse: (i) Arc of circles method (ii) Rectangle method (ii) 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

PROJECTION OF 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

PROJECTION OF 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, 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 Soft wares 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
1. Luzadder and Duff; *Fundamentals of Engineering Drawing*
2. N. D. Bhatt; *Engineering Drawing*
3. K. Venugopal; *Engineering Drawing and Graphics*
4. P.S. Gill; *Engineering Graphics*
5. P.I. Varghese; *Engineering Graphics*
6. K.R. Gopalakrishnan; *Engineering Drawing*
7. Thamaraselvi; *Engineering Drawing*
8. K.C. John; *Engineering Graphics*
9. 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
Statics of rigid bodies-Classification of force systems- principle of transmissibility of a force-composition and resolution- Resultant and Equilibrant of coplanar concurrent force systems-various analytical methods- - Lami’s theorem, method of resolution- Conditions of equilibrium-Moment of a force, couple, properties of couple- Varignon’s theorem- Resultant and equilibrant of coplanar non-concurrent force systems- Conditions of equilibrium. Equilibrium of rigid bodies-free body diagrams.(simple problems)
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).
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:

8. Jha and Sinha, “Construction and Technology”
10. 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

Credits: 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

2. Gill, Smith and Zuirys, “Fundamentals of IC Engines”
3. Amstead, Ostwald and Begeman, “Manufacturing processes”
5. Roy and Choudhary, “Elements of Mechanical Engineering”
6. Hajra Choudhary, “Workshop Technology”
7. R K Bensal, “Fluid mechanics and machines”

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.
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 1-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
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 1 (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 2 (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 3 (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. (6hrs)

(e) Mobile communication: basic principles of cellular communications, concepts of cells, frequency reuse, principle and block diagram of GSM, principle of CDMA, WLL & GPRS technologies. (4hrs)

(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
1. Santiram Kal, Basic Electronics – Devices, Circuits and IT fundamentals, PHI
2. Louis, E. Frenzel, Principles of Electronic Communication Systems, TMH
4. M. Moris Mano, Computer Architecture, PHI
5. Neil H E Weste, Kamran Eshraghian, Principles of CMOS VLSI design – A system perspective, Pearson Education [Module 1(f)]
6. David A. Bell, Electronic Instrumentation and Measurements, PHI [Module 2(a)]
7. N N Bhargava, D C Kulshreshtha, S C Gupta, Basic Electronics & Linear Circuits, TMH
9. R.R. Gulati, Monochrome and Colour Television, New Age International [Module 2 (c)]

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.
A. Carpentry:
   Study of tools and joints. Practice in planning, chiseling, marking and sawing. Joints
   – Cross joint, T joint, Dove tail joint.

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.

D. 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.
Syllabus III Semester

08.301 ENGINEERING MATHEMATICS II (CMPUNERFHBTA)

L-T-P : 3-1-0

Credits: 4

Module I

Module II
Fourier series: Fourier series of periodic functions of period 2\[\pi\] and 2l. Dirichlet’s condition for convergence. Odd and even functions. Half range expansions.
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:

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.
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)
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
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.
3. Langsam, Data Structures Using C and C++, 2/e, Pearson Education.

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
RC Circuits: Response of high pass and low pass RC circuits to sine wave, step, pulse and square wave inputs, Tilt, Rise time. Differentiator, Integrator.
Small signal diode model for low and high frequencies, clipping and clamping circuits.
Analysis of Half wave, full wave and bridge rectifiers. Analysis of L, C, LC & π Filters. Zener voltage regulator, transistor series (with feedback) and shunt voltage regulators, Short circuit and fold back protection.

Module II
DC analysis of BJTs - BJT as amplifier. Small signal equivalent circuits (Low frequency π and h models only). Transistor Biasing circuits, Stability factors, Thermal runaway. BJT as switch.
Small signal analysis of CE, CB, CC configurations using approximate hybrid π model (gain, input and output impedance)
Analysis of Single stage discrete MOSFET amplifiers – small signal voltage and current gain, input and output impedance of Basic Common Source amplifier, Common Source amplifier with and without source bypass capacitor, Source follower amplifier, Common Gate amplifier.

Module III
High frequency equivalent circuits of BJTs, MOSFETs, Miller effect, short circuit current gain, s-domain analysis, amplifier transfer function. Analysis of high frequency response of CE, CB, CC and CS, CG, CD amplifiers.

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

References:
4. R E Boylstad and L Nashelsky: Electronic Devices and Circuit Theory, 9/e, Pearson Education
5. Gopakumar: Design and Analysis of Electronic Circuits, Phasor 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. 
( Minimum 60% Problems and Analysis)
Module I
Binary codes, BCD, Switching algebra, Boolean rules, laws and theorems.
Sum of product and product of sum simplification, Canonical forms, Karnaugh map (up to 4 variables), completely and incompletely specified functions. Quine McCluskey method (up to 5 variables).
Combinational logic circuits – general approach to combinational logic design. Decoders, encoders, multiplexers, demultiplexers. Adders, subtractors, ripple carry and look ahead carry adders, BCD adders, and binary comparators.

Introduction to VHDL – Logic gates, Half adder and Full adder using VHDL.
Memories – ROM, PROMs, RAMs – Basic structure, Static and dynamic RAMs.

Module II
Integrated Circuit technologies – Characteristics and Parameters. TTL Circuits – NOT, NAND, NOR, Open collector, tristate gates, positive and negative logic, ECL OR-NOR, CMOS- NOR, NOT, NAND, comparison.

Differences between combinational and sequential circuits – 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.

Module III
Mealy and Moore models, state machine notation, state diagram, state table, transition table, excitation 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, Analysis of asynchronous sequential machines, Flaw tables, State assignment- races and cycles, shared and multiple row state assignment.
Hazards – causes of hazards, Logic hazards, essential hazards, design of hazard free combinational networks.

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 60% Design and 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.
1. Characteristics of TTL and CMOS gates.
2. Realization of logic circuits using TTL / CMOS (NAND / NOR) gates.
4. Astable and Monostable multivibrators using TTL/CMOS gates
5. Realization of RS, T, D, JK and Master Slave flip-flops using gates.
6. Shift Registers, Ring counter and Johnson counter (using gates and 7495)
7. Counters, up/down counters (asynchronous & synchronous) using flip flops.
8. Counter ICs, Sequence generator (7490,7493,7495).
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.
13. Simulation of Half adder, Full adder using 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.
Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.
**Syllabus IV Semester**

**ENGINEERING MATHEMATICS - III**

**08.401 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:**

**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
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:
1. K.K. Dewett, Modern Economic theory
3. Mohinder Kumar Sharma – Business Environment in India
5. Rudder Dutt and K.P.M Sundaran – Indian Economy
8. Double Entry book Keeping – Batliboi
9. 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
Classification and Representation of Continuous time and Discrete time signals. Signal operations.
Continuous Time and Discrete Time Systems - Classification, Properties. Representation - Differential
Equation representation of Continuous Time Systems. Difference Equation Representation of Discrete
Systems.
Continuous Time LTI systems and Convolution Integral, Discrete Time LTI systems and linear
convolution.

Module II
Frequency Domain Representation of Continuous Time Signals - Continuous Time Fourier Series:
Frequency Domain Representation of Discrete Time Signals - Discrete Time Fourier Transform:
Properties, Sampling Theorem, aliasing, reconstruction filter, sampling of band pass signals, Relation
between Digital Frequency and Analog Frequency of sampled signals.
Fourier Series Representation of Discrete Time Periodic Signals.

Module III
Laplace Transform – ROC – Inverse transform – properties – Analysis of Continuous LTI systems
using Laplace Transform – unilateral Laplace Transform. Relation between Fourier and Laplace
Transforms.
Z transform – ROC – Inverse transform – properties – Analysis of Discrete Time LTI systems using
Random process - Stationarity, Ergodicity, Correlation, Power spectral density – properties. Wiener -
Khinchin Theorem. Transmission of Random process through a linear Filter. Gaussian process –
properties.

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)
Module I
Analysis of BJT tuned amplifiers, synchronous and stagger tuning.

Module II
Feedback amplifiers - Properties of negative feedback. The four basic feedback topologies - Series-shunt, series-series, shunt-shunt, shunt-series.
Analysis and design of discrete circuits in each feedback topology (BJT only) - Voltage, Current, Transconductance and Transresistance amplifiers, its loop gain, input and output impedance., Stability of feedback circuits. Effect of feedback on amplifier poles, frequency compensation - Dominant pole and Pole-zero.
Multistage amplifiers - cascade and cascode amplifiers and its dc analysis.
Frequency response of cascade and cascode amplifiers. Bode plot of multistage Amplifier, Phase and gain margin.

Module III
Transistor switching circuits: Transistor as switch, biasing, Transistor switching times. (Delay, rise, storage and fall time). Analysis of collector coupled Astable, Monostable and Bistable multivibrators, Schmitt trigger - analysis.
Sweep circuits - Bootstrap sweep and current sweep circuits - analysis.

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

Reference:
4. Millman and Taub: Pulse Digital and Switching Waveforms, 2/e, TMH.
5. Gopakumar: Design and Analysis of Electronic Circuits, Phasor 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.
(Minimum 60% Problems and Analysis)
Module I
Simplified internal circuit of 741 op-amp. DC analysis, Gain and frequency response.
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
Filters: Butterworth Ist order Low pass, high pass, bandpass and band elimination. Biquadratic filter (single op-amp with finite gain non inverting-Sallen and key) of Low pass, High pass, Band pass and Band elimination filters. Tow-Thomas filters. Filters using Antoniou gyrator.
Switched capacitor Resistor, switched capacitor Integrator, Ist order SC filter, IInd order SC filter based on Tow-Thomas. Sample and hold circuits.
D/A converters: DAC characteristics- resolution, output input equations, Weighted resistor, R-2R network, DAC 08.
A/D converter: ADC characteristics, Types - Dual slope, Counter ramp, Successive approximation, flash ADC - AD670.

Module III
Analog multipliers – emitter coupled pair as simple multiplier, Gilbert multiplier cell, four quadrant multiplier, Gilbert multiplier as a balanced modulator and phase detector, AD532.
Monolithic Waveform generators – grounded capacitor VCO and emitter coupled VCO, IC8038.
Basic PLL topology and principle, transient response of PLL, Linear model of PLL, Major building blocks of PLL – analog and digital phase detector, VCO, filter.
Applications of PLL. Monolithic PLL - IC LM565 and CD4046 CMOS PLL.
Monolithic Voltage Regulators – IC 723 and its Applications, Current boosting, short circuit and fold back protection. 555 Timer and its application.

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

Reference:
5. Somanathan Nair,Linear Integrated Circuits,John Wiley,2009

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% Design, Analysis and Problems)
Module I
Amplitude modulation - Modulation Index, Modulation Index for Sinusoidal AM, Average power for sinusoidal AM, Effective Voltage and Current for Sinusoidal AM, Nonsinusoidal Modulation, DSBSC Modulation, Amplitude Modulator Circuits, Amplitude Demodulator Circuits, Diagonal Peak Clipping, AM Transmitters – Broadcast Transmitters.
Pulse Modulation - PAM - TDM, PPM, PWM.

Module II
Angle Modulation - Frequency modulation, Sinusoidal FM, Frequency spectrum for sinusoidal FM, Average power in sinusoidal FM, Non-sinusoidal modulation-deviation ratio, Measurement of modulation index for sinusoidal FM.
Phase modulation- Equivalence between PM and FM, Sinusoidal Phase Modulation, Digital Phase Modulation.
Angle modulator Circuits – Varactor Diode Modulators, Transistors Modulators, FM Transmitters – Direct & Indirect Methods, FM Broadcast,
Angle modulation detectors – Foster-Seeley discriminator, Ratio Detector, Quadrature Detector, PLL Demodulator, Automatic Frequency Control, Amplitude Limiters, Pre-emphasis and De-emphasis, FM Broadcast Receivers, FM Stereo Receivers.

Module III

Text Books:
1. Dennis Roody & John Coolen: Electronic Communication, 4/e, PHI.
2. Wayne Tomasi, Advanced Electronic Communications Systems, 6/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 25% Problems)
1. Feedback amplifiers (current series, voltage series) - Gain and frequency response
2. Power amplifiers (transformer less), Class B and Class AB.
3. Differential amplifiers (using BJT and MOSFETs) - Measurement of CMRR
5. Cascode amplifiers (using BJT and MOSFETs) - Frequency response.
7. Astable, Monostable and Bistable multivibrator circuits.
10. Series voltage regulator circuits – short circuit and fold back protection.
12. Introduction to SPICE and simulation of experiments 4, 5, 6 and 7 listed above using SPICE.

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 examinations to be conducted covering the experiments (1 – 11) only.

Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.
1. Familiarization of Operational amplifiers- Inverting and Non inverting amplifiers, frequency response, Adder, Integrator, comparator and voltage level detector.
3. Difference Amplifier and Instrumentation amplifier.
5. Triangular and square wave generators using Op- Amplifier.
6. Wien bridge oscillator using op-amplifier with amplitude stabilization and amplitude control, RC Phase shift Oscillator.
8. IC voltage regulators (723), low & high voltage regulation Short circuit and Fold back protection.
11. Active second order filters using Op-Amp (LPF, HPF, BPF and BSF)
12. Filters using gyrator 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.
Syllabus V Semester

ENGINEERING MATHEMATICS – IV

08.501 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 -

\[
\int_{0}^{2\pi} f(\sin \theta, \cos \theta) \, d\theta, \quad \int_{-\infty}^{\infty} f(x) \, dx
\]

(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:
4. David C Lay, Linear Algebra with Applications, Pearson Education
5. Schaum Series, Linear Algebra.
6. Kenneth Hoffmann and Ray Kunze, Linear Algebra, PHI.
7. Gareth Williams, Linear Algebra with Applications, Jones and Bartlett publications
8. 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
1. A.V. Oppenheim & Ronald W Schafer: Discrete Time Signal Processing, 2/e, PHI.

Reference:
1. John G Proakis, Dimitris G Monolakis-Digital Signal Processing, 4/e, PHI.
2. Emmanuel C Ifeachor, Barrie W Jervis: Digital Signal Processing, 2/e, Pearson Education /PHI.
4. Uwe Mayer-Baeses, Digital Signal Processing with FPGAs, 2/e, Springer.

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)
Module 1
DC machines- Principle of operation of dc generator, constructional details, emf equation, types of generators. Principle of operation of dc motors. Electrical and mechanical characteristics of dc series, shunt and compound motors, applications.

AC motors- Principle of operation, rotating magnetic field, single phase and three phase induction motors.

Module 2
Power devices- power BJT, power MOSFET and IGBT - steady state and switching characteristics. Drive requirements. Design of simple drive circuits for power BJT, power MOSFET and IGBT. Principle of DC motor control. Principle of PWM switching control. Two quadrant, four quadrant converter circuit.

Controlled rectifiers. Principle of phase controlled converter operation. Single phase half wave and full wave controlled rectifiers with R, RL and battery loads.

Module 3
Basic configurations of switched mode inverter-principle of PWM switching schemes for square wave and sine wave output. Single phase inverters-half bridge, full bridge and push pull inverter, voltage source inverter. Block diagram of UPS


Text Book

References
1. B.L Theraja and A.K Theraja. A textbook of Electrical Technology. AC and DC machines, Volume 11, S Chand and Company LTD
2. Mohammad H Rashid ,. Second edition Prentice Hall of India
3. R.Krishnan, Electric Motor Drives, Modeling Analysis and Control, 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 40% Problems and design)
Module I
Review of vector calculus, spherical and cylindrical coordinate system, coordinate conversion, elemental displacement, area and volume for spherical and cylindrical coordinate system. curl, divergence, gradient in general coordinate system, spherical and cylindrical coordinate system. Vector potential , Energy stored in Electric field, Poisson and Laplace equations, Determination of E and V using Laplace equation. Derivation of capacitance and inductance of two wire transmission line and coaxial cable. Boundary condition of electric field and magnetic field. Equation for continuity, dielectric relaxation time, vector magnetic potential A. Maxwell’s equation from fundamental laws. Relation between E, V and A.

Module II
Solution of wave equation, Propagation of plane EM wave in partially conducting media, in perfect dielectric, in good conductors, attenuation, phase velocity, group velocity, skin depth, Reflection and refraction of plane electromagnetic waves at boundaries for normal & oblique incidence – Snell’s law of refraction, Brewster angle, Poynting vector, Poynting vector theorem, Complex Poynting vector. Polarization of electromagnetic wave and derivation of polarization angle.

Uniform transmission line, transmission line parameters. Loading of transmission lines. transmission line equations. Voltage and Current distribution.

Module III
The hollow rectangular wave guide – modes of propagation of wave, dominant mode, calculation of attenuation in wave guides, guide wavelength and impedance.

Text Books :

References:
3. David K. Cheng: Field and Wave Electromagnetics, 2/e, Pearson Education
4. Hayt: Engineering Electromagnetics, 7/e, TMH.
5. Edward C Jordan: Electromagnetic waves and Radiating 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. (Smith chart should be provided if needed.)

(Minimum 75 % problems, derivations and proof.)
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

Module III

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
Process synchronization: Implementing control ,synchronization , Semaphores.
Memory management : Memory allocation preliminaries, Contiguous Memory allocation, noncontiguous Memory allocation ,Virtual memory using paging, Virtual memory using segmentation.
Protection and security :Encryption of data. Protection and security mechanisms.
Distributed operating systems : Definition and examples , Design issues of Distributed operating systems , Networking issues .Communication protocols.

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

References
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:

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:

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
EMI Environment – Sources of EMI, conducted and radiated EMI, Transient EMI, EMI-EMC definitions, units, parameters. EMI coupling principles- Conducted, Radiated and Transient Coupling, Common Impedance Ground Coupling, Radiated Common Mode and Ground Loop Coupling, Radiated Differential Mode Coupling, Near field cable to cable coupling. Power mains and power supply coupling.

Module II
EMI specifications, standards, limits - units of specifications, Civilian and Military standards. EMI measurements – EMI test instruments, systems, EMI test, EMI shielded chamber, Open area test site, TEM cell Antennas, conductors, sensors, injectors, couplers, Military test methods and procedures, calibration procedures. Crosstalk - Three-conductor transmission lines, shielded wires, twisted wires, shielding.

Module III
EMI control techniques – shielding, filtering, grounding, bonding, Transient suppressors, Isolation transformer, Cable routing, signal control, component selection and mounting. EMC design of PCB – PCB traces cross talk, impedance control, power distribution decoupling, zoning, motherboard designs.

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 40% Problem, derivation and Proof)
1. AM generation using discrete components.
2. AM using multiplier IC AD534 or AD633.
3. AM detection using envelope detector.
4. IF tuned amplifier.
5. FM using 555 IC.
7. FM generation and demodulation using 4046.
8. Frequency multiplier using 4046.
9. PAM modulator and demodulator
10. PWM Modulation & Demodulation using 555 timer
11. PPM Modulation & Demodulation using 555 timer

**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.
PART A: Experiments on Digital Signal Processors.
1. Sine wave generation.
2. Real Time FIR Filter implementation (Low-pass, High-pass and Band-pass)
3. Real Time IIR Filter Implementation (Low-pass, High-pass and Band-pass)
4. Pseudo Random Sequence Generator.
5. Real time DFT of sine wave.
6. 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).
9. Study of sampling rate conversion by a rational factor.

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 experiments.)
(b) Implementation (Usage of Kits and trouble shooting) - 15% (Coding for Software experiments.)
(c) Result - 35% (Including debugging of Program for software experiments.)
(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 VI Semester

08.601 MICROCONTROLLER BASED SYSTEM DESIGN (TA)
L-T-P: 3-1-0 \( \text{Credits: 4} \)

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
8051 interfacing - keyboard, stepper motor, ADC , DAC, and LCD module interface. Applications - square wave and rectangular wave generation, frequency counter and temperature measurement.
PIC microcontrollers - introduction, architecture (block diagram explanation only ), and pin details of PIC 16F877 . Memory organization, ports and timers in PIC 16F877.

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:

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
Components of control system – Open loop and closed loop control systems - Modeling in frequency domain - Mechanical and electromechanical systems. State – space representation – Converting transfer function to state space and state space to transfer function.
Design process - Signal flow graphs - Mason’s rule formula. Standard test signals, natural frequency and damping ratio, time response specifications.
Time response of first and second order systems - Steady state and dynamic error coefficients.

Module II

Module III

Text Book :
1. Benjamin C. Kuo: Automatic Control Systems, 8/e, Wiley India.
2. Ogata K., Discrete-time Control Systems, 2/e, Pearson Education.

References:
1. Norman S Nise : Control System Engineering,5/e, Wiley India

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 75 % problems, derivations and proof.)

Assignment for Sessional marks may be problems based on MATLAB /LABVIEW or any other software packages covering the syllabus above.
Module I
Pulse Modulation - Sampling process, Aliasing, Reconstruction, PAM, Quantization, PCM, Noise in PCM system, Modifications of PCM – Delta modulation, DPCM, ADPCM, ADM, Processing Gain.

Module II
Signal space Analysis – Geometric representation of signals, analyzer and synthesizer, distance, norm, inner product and orthogonality, Gram Schmidt orthogonization procedure.
Conversion of the continuous AWGN channel into a vector channel – Statistical Characterization of correlator outputs, Likelihood function – Coherent detection of signals in noise – Maximum a posteriori probability Rule, Maximum likelihood Detection, correlation receiver – probability of error.
Pass band Digital Transmission – Transmission model, Error rate analysis, Coherent phase shift keying, Hybrid amplitude and phase modulation schemes, coherent frequency shift keying, Detection of signals with unknown phase, Non coherent orthogonal modulation, Differential phase shift keying, Comparison of digital modulation schemes.

Module III
Spread spectrum communication - Pseudo-noise sequences, Properties of PN sequences. Generation of PN Sequences, generator polynomials, Maximal length codes and Gold Codes. Spread spectrum communication – Notion of spread spectrum, Direct sequence spread spectrum with coherent binary phase shift keying, Signal space dimensionality and processing gain, Probability of error, Anti-jam Characteristics, Frequency Hop spread spectrum with MFSK, Slow and Fast frequency hoping.
Multiple Access Techniques, multipath channels, classification, Coherence time, Coherence bandwidth, Statistical characterization of multi path channels, Binary signaling over a Rayleigh fading channel. Diversity techniques - Diversity in time, frequency and space. TDMA and CDMA – RAKE receiver. Source coding of speech.

Text book:

References:
3. Sam Shanmugham – Digital and Analog Communication systems, Wiley India.
5. John G. Proakis, Masoud Salehi: communication Systems Engineering, 3/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)
Module I

Module II

Module III

Text Books :
1. John D. Krauss: Antennas for all Applications, 3/e, TMH.
2. Constantine A Balanis; Antenna Theory and Design, 2/e, Wiley Publications.
3. E.C. Jordan & K G Balmain: Electromagnetic Waves & Radiating Systems, 2/e, PHI.

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 proof.)
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.
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:
1. 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
Errors in measurements, accuracy, precision, sensitivity, resolution of instruments
Transducers - classification – general input output configuration – static and dynamic characteristics.
Resistance Transducers-Principles of operation, characteristics of resistance transducers, resistance
potentiometer. Inductive Transducers-induction potentiometer, variable reluctance transducers,
LVDT, eddy current transducers, synchros and resolver. Capacitive Transducers-variable air gap
type, variable area type, variable permittivity type, capacitor micro phone.

Module II
Measurement of Displacement and Strain- Resistive, inductive and capacitive transducers for
displacement. Wire, metal film and semiconductor strain gauges. Measurement of Force and Pressure-
Column, ring and cantilever-beam type load cells. Elastic elements for pressure sensing - using
displacement sensors and strain gauges with elastic elements. Measurement of Vibrations- Importance
of vibration measurement, frequency range of vibrations. Absolute displacement, velocity and
acceleration pick-ups; Mass-spring-damper system as absolute acceleration to relative displacement
converter; Strain gauge and piezoelectric type acceleration pickups. Measurement of Speed and
Torque- Electro-magnetic and photoelectric tachometers; Torque shaft, strain-gauge, electromagnetic
and radio type torque meters.

Module III
Measurement of resistance, inductance and capacitance using bridges - Wheatstone, Kelvin and
Maxwell bridges. Megger and Q meter. Electronic multimeter, Audio Power Meter, RF power meter,
True RMS Meter.
The Cathode Ray Tube, Deflection amplifier, Resolution, Wave form display, Oscilloscope time -
base, Dual trace oscilloscope, Dual beam and split beam, Z axis modulation, oscilloscope probes.
Special oscilloscopes – Operation, controls and application of Analog storage, Sampling and Digital
and SEM instruments. Spectrum analyser

Text Books:

Reference:

Question Paper
The question paper shall consist of two parts. Part 1 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.
A. **Programming experiments using 8051 Trainer Kit.**

1. Addition and Subtraction of 16 bit numbers.
2. Multiplication and division of 8 bit numbers.
3. Sorting, Factorial of a number.
4. Multiplication by shift and add method.
5. LCM and HCF of two 8 bit numbers
6. Matrix addition
7. 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)
1. Discrete component circuits.
2. Timer ICs based circuits.
3. Op-Amp ICs based circuits.
4. Digital ICs based circuits.
5. Microcontroller based circuits.
6. 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.
1. Water Level Controller.
2. Water Level Indicator.
4. Light Dimmer.
6. FM Transmitter.
7. Dancing Light.
8. Audio Level Indicator.
9. Clap Switch/Sound Operated Switch.
10. Touch Sensitive Switch.
12. Regulated Power Supply (Rectifier-Filter-Regulator)
13. Count Down Timer.
15. 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) Credits: 3
L-T-P: 2-1-0

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
Optical detectors: types and characteristics- structure and working of PIN and APD. Noise in detectors and comparison of performance.

Module II
Optical receivers- Ideal photo receiver and quantum limit of detection. The effects of noise. Types of pre-amplifiers.
Digital transmission systems- Design of IMDD links- power and rise time budgets, effects of noise.
Optical Amplifiers- comparison of different types- doped fiber amplifiers- EDFA- basic theory, structure and working. Noise in EDFA.

Module III
Multi-Giga bit systems—The WDM concept and components, Couplers, Add/ Drop Multiplexers, gratings, wavelength tunable sources, the challenges in DWDM.

Text Books:

References:
2. John M Senior- *Optical communications, 2/e*, PHI.
3. Harold Kolimbiris- *Fiber Optics Communications* – 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 25% Problem, derivation and Proof)
Module I
Cavity Resonators - Rectangular and Circular wave guide resonators- Derivation of resonance frequency of Rectangular cavity. Klystrons - Re-entrant cavities, Velocity modulation, Bunching (including analysis), Output power and beam loading, Reflex Klystron, Derivation of Power output, efficiency and admittance. Traveling wave tubes – Slow wave structures, Helix TWT, Amplification process, Derivation of convection current, axial electric field, wave modes and gain.

Module II
Magnetron oscillators – Cylindrical magnetron, Cyclotron angular frequency, Power output and efficiency.

Module III
Microwave Communication – Advantages – Analog and digital microwave – FM microwave radio system, Repeaters, Diversity reception, Protection Switching arrangements, FM microwave radio stations, Path characteristics, System gain.

Text Books:
2. Robert E. Collin: Foundation of Microwave Engineering, 2/e, Wiley India.
3. Wayne Tomasi: Advanced Electronic Communication Systems, 6/e, PHI.

References:
1. David M Pozar: Microwave Engineering,3/e, Wiley 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 50% Problems, derivations and proofs)
Module I

Module II

Module III

Text Books:
2. Ranjan Bose: Information Theory, Coding and Cryptography, 2/e,TMH, New Delhi

References:
4. Das Mullick Chatterjee, Principles of Digital communication , Wiley Eastern Ltd.
5. Simon Haykin, Communication Systems,4/e, John Wiley & Sons Pvt. Ltd

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)
08.705 REAL TIME OPERATING SYSTEMS (TA)  Credits: 3

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
Primality testing- pseudo primes- the rho method. Elliptic curves and elliptic curve cryptosystems.
Data Encryption standard(DES), Advanced Encryption standard (AES).
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

Module II

Module III

Text Books:
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4/e, Academic Press, 2009

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)
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
Junction photodiode: PIN, heterojunction and avalanche photodiode. Comparisons of various photo detectors, High speed measurements. Beam optics-Gaussian beam, properties, beam quality. Transmission through optical components

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:
2. Linda Shapiro and George Stockman, Computer Vision, Prentice Hall, 2001
5. Adrian Low, Introductory Computer Vision, Imaging Techniques and Solutions, 2/e, BSP, 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 60% Problem, derivation and Proof)
08.755 CDMA SYSTEMS (T)
L-T-P : 2-1-0
Credits: 3

MODULE I
Introduction to CDMA, Direct Sequence(DS)- Frequency Hopped(FH)- Pulse Position Hopped(PH)
SS Signals. Orthogonal and Quasi-Orthogonal expansion of SS signals.
Reception of SS signals in AWGN channel-. Coherent Reception of DS CDMA (uplink and
downlink) and FH SS signals.

MODULE II
Forward Error Control Coding in SS systems. Non coherent Reception of encoded DS CDMA
Systems. convolutional coding in DS CDMA, orthogonal convolutional coding. Coding in FH CDMA
Systems
Pseudo Signal Generation- Pseudorandom sequences- ML Linear shift register- Randomness property.
Generation of pseudorandom signals from pseudorandom sequences.
Synchronisation of Pseudorandom signals, acquisition process. Shannon Capacity of DS CDMA ,
FH CDMA Systems.

MODULE III
CDMA Networks- hand off strategy, Power control, erlang capacity of CDMA System.Interference
Cancellation -SIC and PIC
Multiuser Detection: Single user matched filter- hypothesis testing- optimal receiver- matched filter in
CDMA Channel, Coherent single user matched filter in Rayleigh fading channel. Optimum detector
for synchronous channels- (Two-user and K-user) and asynchrounous channel. Decorrelating Detector
(DD)- DD in synchronous and asynchronous channels. . Non Decorrelating linear multiuser
detection- optimum linear multiuser detection. MMSE Linear multiuser detection.

Text Books:
1 . Kamil Sh Zigangirov, Theory of Code Division Multiple Access Communication, IEEE Press,
    Wiley InterScience , 2004

Reference:
1. Samuel C Yang, CDMA RF System Engineering, 1998, Arect house Inc,

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)
08.706 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 1
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 2

Module 3
I/O Subsystems – Interrupt Routines Handling in RTOS, RTOS Task scheduling models - Handling of task scheduling and latency 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 1
Trademarks-Introduction, condition and procedure for registration, rights and limitations of registration ,infringement of trade mark, remedies against infringement, offences and penalties.

Module 2
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 3
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

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)
Module I
Helical antenna – normal mode and axial mode helical antennas – design considerations.
Planar Antennas - Micro strip rectangular and circular patch antennas- Analysis and design, Feeding methods.

Module II
Broadband Antennas- Folded dipole, Sleeve dipole and Biconical antenna- Analysis, Antenna matching techniques.

Module III
Antennas for mobile communication - Handset antennas, Base station antennas.

Text Books:
2. John D. Krans, Ronald J. Marhefka, Antennas for all Applications ,3/e, TMH.

Reference:
1. Sopholes J.Orfanidis, Electromagnetic waves and Antennas.at:
   www.ece.rutgers.edu/~orfanidi/ewa

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 should be answered. (Smith chart should be provided if needed.)
(Minimum 60 % problems , derivations and proof.)
1. Inductor and transformer design and testing.
2. MOSFET gate drive circuits.
3. Power BJT Drive circuits.
4. Temperature Controlled ON/OFF Relay Circuit.
5. Light Controlled ON/OFF Relay Circuit.
6. Linear Ramp Firing Circuit.
7. Sine Triangle PWM generation.
8. Step-Down DC-DC Converter.
11. Electronic Dimmer Circuit for lighting.
12. Battery Charger circuit with over voltage protection.

Note: For University examination, the following guidelines should be followed regarding award of marks
(a) Circuit and design - 20%
(b) Implementation - 10%
(c) Result - 40%
(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 COMMUNICATION SYSTEMS LAB (T)

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

Part A: Hardware Experiments:

1. Delta Modulation & Demodulation.
2. Sigma delta modulation.
3. PCM (using Op-amp and DAC).
4. BASK (using analog switch) and demodulator.
5. BPSK (using analog switch).
6. BFSK (using analog switch).
7. Error checking and correcting codes.
8. 4 Channel digital multiplexing (using PRBS signal and digital multiplexer).

Part B: Matlab or Labview Experiments:

1. Mean Square Error estimation of a signals.
2. Huffman coding and decoding.
4. Time delay estimation using correlation function.
5. Comparison of effect in a dispersive channel for BPSK, QPSK and MSK.
6. Study of eye diagram of PAM transmission system.
7. Generation of QAM signal and constellation graph.
8. DTMF encoder/decoder using simulink.

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

(a) Circuit and design - 20% (Logical design and flow diagram in case of software Expts.)
(b) Implementation - 10% (Coding in case of Software Expts.)
(c) Result - 40% (Including debugging of Program in case of 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.
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 Evaluation (50 Marks)

1. Evaluation of Presentation : 30 marks
2. Evaluation of Report : 20 marks
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:
1. Evaluation of the report : 25 marks
2. Viva : 25 marks
Syllabus VIII Semester

08.801 NANOELECTRONICS (TA) 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 in nanostructures
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

References
4. Poole, Introduction to Nanotechnology John Wiley 2006
5. Chattopadhyay, Banerjee, Introduction to Nanoscience & Technology, PHI 2009
6. 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)
Module I

Module II
Television: Scanning, Blanking and synchronisation, Picture signal - composite video signal- Vestigial sideband transmission-Principle of CCD Camera - Monochrome picture tube- Monochrome TV receivers- RF tuner, VHF tuner- Video amplifier, IF section, Vestigial sideband correction- Video detectors, Sound signal separation, AGC, sync separation, horizontal and vertical deflection circuits, EHT generation.
Colour TV system: Principle of colour signal transmission and reception, PAL, NTSC, SECAM (block schematic description), Picture tube – delta gun.

Module III

Text Books:

Reference :
1. Shlomo Ovadia: *Broadband Cable TV Access Networks*, PH-PTR, 2001

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 20% Problems, derivations and proofs)
Module I
Physical layer: Cables for Networking Coaxial cables, UTP, Fiber Optic cables.
Data link Layer: Framing, Frame length design, SONET and HDLC. Error Detection, Internet Checksum.
Reliable Transmission, Stop and wait protocol, Sliding window protocols. Ethernet, MAC Layer design, CSMA/CD. Logical Link Control. WLAN, CSMA/CA. Switching and Forwarding, Bridges and LAN Switches- Learning Bridges, Spanning Tree algorithm, Broadcast and Multicast, Virtual LAN (VLAN).

Module II

Module III
Introduction to Ethernet Passive Optical Networks (EPONs)

Text Book :
Larry Peterson and Bruce S Davie: Computer Network- A System Approach, 4/e, Elsevier India.

Reference:
1. J FKurose, Computer Network A Topdown Approach Featuring the Internet,3/e, Pearson Education.

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

Module II

Module III
Direct sequence modulation, spreading codes, the advantage of CDMA for wireless, code synchronization, channel estimation, power control- the near-far problem, FEC coding and CDMA, multiuser detection, CDMA in cellular environment. Space diversity on receiver techniques, multiple input multiple output antenna systems, MIMO capacity for channel known at the receiver -ergodic capacity, space division multiple access and smart antennas.

Text books:
2. Theodore S. Rappaport: *Wireless communication principles and practice,2/e*, Pearson Education

References:
1. Tri. T. Ha, *Digital satellite communication,2/e*, Mc graw Hill.
2. M. Ghavami, L. D. michael, k Rohino, Ultra-wide band signals in communication engineering, Wiley Inc.

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)

98
Module I
Atmospheric flight mechanics, Aerostatics, Bernoulli’s equation, Air data instruments-Pitot and static systems, Altimeter and its types, Airspeed indicator, Mach meter, Vertical speed indicator. Gyroscopic instruments and compasses. Static stability and control - Longitudinal control, Stick forces, Directional stability and control, Roll stability and control.

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 40% Problem, derivation and Proof)
Module I
Introduction, advantages, comparison of optical IC with electrical IC, applications of integrated optics, substrate materials for optical IC. Optical wave guide mode, modes in a planar wave guide, ray optic approach to optical mode theory, basic three layer waveguide, symmetric and asymmetric waveguide, rectangular channel and strip loaded waveguides. Wave guide fabrication technique, deposited thin film, substitution dopant atoms, carrier concentration reduction wave guide, epitaxial growth, electro optic wave guide.

Module II
Polymer and fiber integrated optics, polymer processing, applications, polymer wave guide devices, optical fiber wave guide devices, fiber sensor, types, applications. Losses in optical wave guide, measurement of losses. Wave guide input and output couplers, types of couplers, coupling between wave guides, coupled mode theory, wave guide modulator, electro optic modulator, single and dual channel electro optic modulator acousto optic modulator. Integrated semiconductor laser, integrated semiconductor optical amplifier, monolithical integrated direct modulator, direct modulation of QD laser, integrated optical detectors, structures, factors affecting the performance, principle of micro optical devices.

Module III
Optical amplifiers, semiconductor laser amplifier, doped fiber amplifiers, Fiber Raman amplifier, fiber Brillouin amplifier, noise characteristics, crosstalk, system applications. Direct detection light wave system, digital optical receiver, direct detection with optical amplifiers, performance. Coherent detection light wave system, system configurations, performance. Soliton light wave system, soliton wave propagation, soliton amplification, system design.

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 20% problems, derivations and proof)
Module I

Module II
Microwave generation and amplification. Structure, Operation, Power output and efficiency of IMPATT and TRAPATT diodes.
Microwave amplifiers and oscillators – Amplifiers – Gain and stability, Single stage transistor amplifier design. Oscillator design – One port negative resistance oscillators.

Module III
Microwave Integrated Circuits -Planar Transmission line – methods of analysis. Micro strip line, coupled strip lines, micro strip coupled lines, Distributed and lumped elements of integrated circuits – capacitors, inductors, resistors, terminations, attenuators, resonators and discontinuities.

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% Problem, derivation and Proof)*
Module I

Module II

Module III

Text Books:
1. Ogata K., Discrete-time Control Systems, 2/e, Pearson Education.
3. Tetley, Electronic navigation system, 3/e, Elsevier 2008

References:
3. N.S Nagaraja, Elements of Electronic Navigation, 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 50% Problem, derivation and Proof)
Module I
Fundamental Concepts - Agents, environments, general model; Problem solving techniques. Search Techniques - Uninformed search, heuristic search, adversarial search and game trees; Solution of constraint satisfaction problems using search.
Knowledge Representation - Propositional and predicate calculus, semantics for predicate calculus, inference rules, unification, semantic networks, conceptual graphs, structured representation, frames, scripts.

Module II
Robotics - 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.

Module III
Transmission elements - Hydraulic, pneumatic and electric drives. Gears, sensors, materials, user interface, machine vision, implications for robot design, controllers.
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.

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)
08.806 MODELLING & SIMULATION OF COMMUNICATION SYSTEMS (T)

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

Module I
Random Number Generation, Testing Random Number Generators.
Modeling of Transmitter and Receiver subsystems: Information sources, Radio frequency and optical modulation. Demodulation and detection, Multiplexing.

Module II
Communication channels and models: Fading and multipath channels, The Almost Free space channel, Conducting and Guided wave media, Finite state channel models.
Estimation of parameters in simulation: Quality of an estimator, Estimating the average level of waveform, Estimating the power spectral density of a process.

Module III
Review of Queuing models, Burke's theorem, Queuing Networks, Operational Laws, Mean value analysis , Hierarchical decomposition of Large Queuing networks: Queuing network model with a load dependent server.
Analysis of simulation Results: Model Verification Techniques, Model Validation Techniques, Transient Removal, Terminating Simulations , Stopping Criteria, Variance Reduction.

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
Introduction to Bioinformatics – Overview.

Module III

Text Books:

References:
2. Leslie Cromwell, Fred J.Weibell and Erich A.Pferffer: Biomedical Instrumentation and Measurements, PHI, New 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.
08.826  INFORMATION SECURITY (T)  
L-T-P : 2-1-0  
Credits: 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.
Module I
Digital instruments - the basics of digital instruments, digital measurement of time interval, phase, frequency, Digital LCR meter, voltmeter and multimeter. Working principle and applications of Wave form analyzer, harmonic distortion meter, harmonic analyser and Spectrum analyzer. Logic state analyser and its application. IEEE - 488 General Purpose Interface Bus (GPIB) Instruments with application. Telemetry- Basic scheme of telemetry, Sources of error, line or transmission error, DC voltage and current telemetry schemes, Radio telemetry, PWM and digital telemetry schemes.

Module II
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, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

Module III
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.

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.
The syllabus shall contain current area of research in Electronics & communication (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.
**08.807 MICROWAVE & OPTICAL COMMUNICATION LAB (T)**

**L-T-P : 0-0-4**

**Credits: 4**

**Microwave Experiments:**
1. GUNN diode characteristics.
2. Reflex Klystron Mode Characteristics
3. VSWR and Frequency measurement.
4. Verify the relation between Guide wave length, free space wave length and cut off wave length for rectangular wave guide.
5. Measurement of E-plane and H-plane characteristics.
6. Directional Coupler Characteristics.
7. Unknown load impedance measurement using smith chart and verification using transmission line equation.
8. Measurement of dielectric constant for given solid dielectric cell.
9. Magic-Tee characteristics.
10. Antenna Pattern Measurement.

**Optical Experiments:**
1. Measurement of Numerical Aperture of a fiber, after preparing the fiber ends.
2. Measurement of attenuation per unit length of a fiber using the cutback method.
3. Preparation of a Splice joint and measurement of the splice loss.
4. Power Vs Current (P-I) characteristics and measure slope efficiency of Laser Diode.
5. Voltage Vs Current (V-I) characteristics of Laser Diode.
6. Power Vs Current (P-I) characteristics and measure slope efficiency of LED.
7. Voltage Vs Current (V-I) characteristics of LED.
8. Characteristics of Photodiode and measure the responsivity.
9. Characteristics of Avalanche Photo Diode (APD) and measure the responsivity.
10. Measurement of fiber characteristics, fiber damage and splice loss/connector loss by Optical Time Domain Reflectometer (OTDR) technique.

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

(a) Design and Implementation - 20%
(b) Result - 50%
(c) Viva voce - 25%
(d) 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.
08.808  
PROJECT (TA)  
Credits: 3

Internal Evaluation only (150 marks)

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.
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.