Mechanical Engineering
with Masters Specialization in
Structural Mechanics

For
FIVE YEAR INTEGRATED
DOUBLE DEGREE MASTERS PROGRAM (IDDMP)
Leading to B.Tech., M.Tech. at JNTUH and
M. Sc. at Blekinge Institute of Technology, Sweden

(Applicable for the Batches admitted from 2014-2015)
JA

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DO

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1) Five Year Integrated Double Degree Masters Program:
JNTUH offers Five Years (10 Semesters) Integrated Double Degree Masters Program (IDDMP) under MOU with Blekinge Institute of Technology, (BTH), Sweden in the following Branches of Engineering, at its Constituent Autonomous College - JNTUH College of Engineering, Hyderabad, with effect from the Academic Year 2014 – 15 onwards.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>UG Program</th>
<th>PG Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>B. Tech. in Electronics &amp; Communication Engineering (ECE)</td>
<td>M.Sc. (Electrical Engineering with emphasis on Radio Communications)</td>
</tr>
</tbody>
</table>
A student would be conferred the B. Tech., M. Tech. and M. Sc. Degrees in this IDDMP, after the successful completion of all the requirements for the 10 Semesters of study and earning the appropriate credits.

2) Eligibility of Admission:

2.1 Admission to the IDDMP shall be made either on the basis of JEE (Main) rank or the merit rank obtained by the qualifying examination at an Entrance Test conducted by the AP State Government (EAMCET), OR the University, OR on the basis of any other order of merit approved by the University.

2.2 Students opting for the 5 Year IDDMP must specify their choice for M. Tech. and M. Sc.(with the specialization given above), after choosing the appropriate Branch of Engineering, at the time of Admissions only. Option thus exercised is final, and cannot be changed during the study period.

2.3 Students opting for 5 Year IDDMP have to study for the specified period, to earn the relevant credits for the award of the B. Tech, M. Tech & M. Sc. Degrees, and they will not be permitted to have a choice for B. Tech. Degree alone after 4 years study.

3) IDDMP Structure:

3.1 The Integrated Double Degree Masters Program comprises of two parts – B. Tech. or UG Program and M. Tech. & M. Sc. or PG Program. The UG and PG Programs have the following groups or categories or components, which may include theory subjects / Laboratory courses / Design / Practicals / Major projects etc. as well.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>UG/PG Program</th>
<th>Group/Category/Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>UG</td>
<td>BS – Basic Sciences</td>
<td>Includes - Mathematics, Physics and Chemistry Subjects</td>
</tr>
<tr>
<td>2)</td>
<td>UG</td>
<td>EAS - Engineering Arts and Sciences</td>
<td>Include fundamental engineering subjects</td>
</tr>
<tr>
<td>3)</td>
<td>UG</td>
<td>HSS – Humanities and Social Sciences</td>
<td>Includes subjects related to Humanities, Social Sciences and Management</td>
</tr>
<tr>
<td>4)</td>
<td>UG</td>
<td>DE – Departmental Electives</td>
<td>Includes Elective subjects related to the parent discipline, department or branch of engineering</td>
</tr>
<tr>
<td>5)</td>
<td>UG</td>
<td>DC – Departmental Core</td>
<td>Includes core subjects related to the parent discipline,</td>
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</tr>
<tr>
<td>6)</td>
<td>UG</td>
<td>OE – Open Electives</td>
<td>Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline, department or branch of engineering</td>
</tr>
<tr>
<td>7)</td>
<td>UG</td>
<td>Project</td>
<td>B. Tech. Project or UG Project or UG Major Project</td>
</tr>
<tr>
<td>8)</td>
<td>PG</td>
<td>PGC</td>
<td>PG Core Subjects related to the M. Tech. &amp; M. Sc. specialization</td>
</tr>
<tr>
<td>9)</td>
<td>PG</td>
<td>PGE</td>
<td>PG Elective Subjects related to the M. Tech. &amp; M. Sc. Specialization</td>
</tr>
<tr>
<td>11)</td>
<td>PG</td>
<td>Comprehensive Viva</td>
<td>Comprehensive Viva based on UG &amp; PG Subjects</td>
</tr>
</tbody>
</table>

**Note:** The PG subjects / Lab / Electives / Thesis / Dissertation / Comprehensive viva as indicated above are tentative. The actual details of courses / Labs / Project / Majors / minors / Seminars etc. will be as per the norms and procedures of BTH, Sweden corresponding PG specialization.

3.2 In the IDDMP, each Subject, Lab., Project, Industrial Training / Seminar / Comprehensive Viva etc. has specified credits, as indicated in the Course Structure. The credit requirements for IDDMP are: (i) at UG Level: 174 credits at B. Tech. level, plus (ii) at PG Level: 80 credits at M. Tech. & M. Sc. level.

3.3 The minimum instruction days for each Semester shall be 90 working days. In a Semester, one lecture hour per week is rated as one credit, and two tutorial or two practical hours per week may be rated as one credit in general.

3.4 There shall be no branch transfers at UG Level, and no changes of specializations at PG Level, after the completion of the First Admission Process.

3.5 The Course Structure and Curriculum for the first 3 years (6 Semesters) would be same as that for earning the Regular 4 Year B. Tech. degree in the respective Branch of Engineering. The PG Project Work for the M. Tech. degree shall commence at the beginning of V Year I Semester, and shall be carried out up to the end of the V Year II Semester at BTH, Sweden.

4) **Course Work:**

4.1 A student after securing admission must pursue the 5 Year Integrated Double Degree Master Program of study for a duration of 10 Semesters (or 5 years). Each Semester shall be of 22 weeks duration (inclusive of examinations), with 16 weeks of instruction days at JNTUH up to 7 Semesters and the remaining Semesters will be as per the regulations of BTH.
4.2 Course work up to and inclusive of IV Year I Semester shall be conducted at JNTUH, IV year II semester and V Year I & II semesters shall be at Blekinge Institute of Technology (BTH), Sweden.

4.3 The student must secure a total of 254 credits for the IDDMP - 174 credits for the B. Tech. degree Program, plus 80 credits for the M. Tech. & M. Sc. Program, under different categories as indicated in Item 3.1 and 3.2.

4.4 The student should complete the IDDMP within a period equal to twice the prescribed duration of the Program, from the Date of Admission. Students, who fails to fulfill all the academic requirements for the award of the Double Degrees within 10 academic years from the Date of Admission, shall forfeit their seat in both B. Tech., M. Tech. & M. Sc. Courses.

5) Attendance Requirements at JNTUH:

5.1 The student shall be eligible to appear for the Semester End Examinations, if he acquires a minimum of 75% attendance in aggregate of all the subjects put together up to IV Year - I Semester in each Semester.

5.2 Condonation of shortage of attendance in aggregate up to 10% (net attendance of 65% and above, and below 75%) in each Semester may be granted by the College Academic Committee. Such condonation shall be granted only on genuine and valid reasons, on representation by the candidate with supporting evidence, and on payment of the stipulated condonation fee.

5.3 Shortage of attendance below 65% in aggregate shall NOT be condoned.

5.4 Students, whose shortage of attendance is not condoned in any Semester, are not eligible to take their End Examinations of that Semester, and their registration for that Semester shall stand cancelled.

5.5 A student shall not be promoted to the next Semester, unless he satisfies the attendance requirement of the present Semester. In such cases, the student may seek re-admission for that Semester, as and when offered.

6) Academic Requirements:

The following academic requirements have to be satisfied, in addition to the attendance requirements specified in Item 5.

6.1(a) U.G. Part: A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory subject / practical subject /design /drawing subject / UG Project, if he secures not less than 35% of marks in the end examination (25 out of 70 marks, or 18 out of 50 marks as case may be), and a minimum of 40% marks in the sum total of the internal evaluation and end examination taken together.

(b) P.G. Part: A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory subject / practical subject / design / drawing / Comprehensive Viva-voice, if he secures a minimum of 40% of marks in the end examination, and a minimum of 50% marks in the sum total of the internal evaluation and end examination taken together.
6.2 A student shall be **promoted from II to III year** only if he fulfills the academic requirements of earning **40 credits from two regular and one supplementary examinations of I year I Semester**, and **One Regular & One Supplementary exam of I year II Semester**, and **one regular examination of II year I Semester** irrespective of whether the candidate takes the examination or not.

6.3 A student shall be **promoted from III year to IV year** only if he fulfills the academic requirements of earning total **67 credits from the following examinations**, whether the candidate takes the examinations or not.

   a. Three regular and two supplementary examinations of I B Tech – I Semester.
   b. Two regular and two Supplementary examinations of I B Tech II Semester
   c. Two regular and one supplementary examinations of II year – I Semester.
   d. One regular and one supplementary examinations of II year II Semester.
   e. One regular examination of III year I Semester

6.4 **A student shall be eligible to proceed to BTH, Sweden for admission into IV Year II Semester level**, if he completes all the subjects and earned all the credits up to III B. Tech, I Semester and UG (Bachelor) Project during IV B. Tech - I Semester at JNTUH.

6.5 The credits earned by each student at JNTUH (inclusive of UG & PG) shall be transferred to BTH, Sweden, only after the student successfully completes and earns all credits up to and inclusive of IV year I semester along with UG Project.

6.6 A student shall be eligible to appear for the end Semester examination in any Subject (Theory/ Lab.) or Seminar/ Comprehensive Viva/ Project etc., but absent at it or has failed in the end examination, may appear for the same at the supplementary examination or subsequent examination as and when offered.

6.7 (a) **When a student is detained due to shortage of attendance in any Semester, he may be re-admitted into that Semester when it is next offered, with the academic regulations of the batch into which he got readmitted.**

   (b) **When a student is detained due to lack of credits in any year, he may be readmitted into the next year after fulfillment of the academic requirements, with the academic regulations of the batch into which he got readmitted.**

6.8 **A student shall register for all the 254 credits as specified in the Course Structure and put up the minimum attendance requirements in all the Semesters, and earn all the 254 (174 at UG level + 80 at PG level) credits for the IDDMP. Marks obtained in all the specified 174 UG credits shall be considered for the calculation of percentage of marks for the B. Tech. Program, and the marks obtained in all the specified 80 PG credits shall be considered for the calculation of % of marks for the M. Tech. & M.Sc. Program. Evaluation of M. Sc. programme performance will be as per BTH norms in vogue.**

6.9 **Students, who fail to earn the 174 UG credits as indicated in the Course Structure, within 8 Academic Years from the Date of Admission, shall forfeit their seat in the IDDMP, and their admission for the entire Double Degree Masters Program shall stand cancelled.**
6.10 Students, having secured the 174 UG credits, but fail to earn all the specified PG credits as indicated in the Course Structure, within 10 Academic Years from the Date of Admission, shall forfeit their seat in the IDDMP, and their registration/continuation for the PG Degree Program shall stand cancelled.

7) Evaluation Procedure:
The performance of a student shall be evaluated in each Semester Subject wise as follows:

7.1 For UG Part of the IDDMP

i) The performance of a student shall be evaluated in each Semester Subject wise with a maximum of 100 marks for Theory and 75 marks for Practical/Laboratory subject. In addition the project work shall be evaluated for 200 marks.

ii) For theory subjects, the distribution shall be **30 marks for Internal Evaluation and 70 marks for the End-Examination**.

iii) For theory subjects, during the Semester there shall be **2 mid-term examinations**. Each mid-term examination consists of **one objective paper for 10 marks**, **one subjective paper for 15 marks with a duration of 110 minutes (20 minutes for objective and 90 minutes for subjective paper)**, and one Assignment for 5 marks. Objective paper shall be set with multiple choice questions, true/false, fill-in the blanks, matching type questions, etc. for 10 marks. Subjective paper shall contain 5 questions, out of which the student has to answer 3 questions, each for 5 marks. The first mid-term examination shall be conducted for the first 50% of the syllabus, and second mid-term examination shall be conducted for the remaining 50% of the syllabus. First Assignment should be submitted before the conduct of the first mid-term examination, and the second Assignment should be submitted before the conduct of the second mid-term examinations. The Assignment shall be as specified by the concerned subject teacher. The total marks secured by the student, in each mid-term examination, are evaluated for 30 marks and the better of the two mid-term examinations shall be taken as the final marks secured by each candidate.

iv) For practical subjects there shall be a continuous evaluation during the Semester for **25 sessional marks and 50 end examination marks**. Out of the 25 marks for internal, **day-to-day work in the laboratory shall be evaluated for 15 marks**, and **two internal examinations for practical’s each of 10 marks**, shall be conducted by the concerned laboratory teachers. The better of two internal exams shall be considered. The End Examination shall be conducted by the teacher concerned and another faculty member of the same Department, as suggested by the Head of Dept.

v) For the Subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing and Estimation etc.), the distribution shall be **30 marks for internal evaluation (15 marks for day-to-day work and 15 marks for internal tests) and 70 marks for end examination**. There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests.

vi) **Open Electives:** Students are to choose One Open Elective (OE-I) during 3rd Year I-Semester and another Open Elective (OE-II) during 3rd Year II-Semester from the corresponding list of Open Electives given. However, students cannot opt for an Open...
Elective subjects offered by their own department, if it is already listed under core / elective subjects offered by that department in any Semester.

vii) The UG Project shall be evaluated for 200 marks, out of which 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Viva-Voce Examination. Out of 60 marks allocated for internal evaluation, 30 marks shall be awarded by the Project Supervisor (based on his continuous performance evaluation of the student), and the other 30 marks shall be awarded by Project Evaluation Committee (PEC) based on the presentation made by the student on the progress of the project at the time of IV Year I Semester I & II-Mid examinations. The PEC shall be constituted by the Head of the Department and shall consist of the Head of the Department, the Supervisor of UG Project and Senior Faculty Member of the Department.

7.2 For M. Tech. (PG) Part of the IDDMP at JNTUH

i) Theory Subjects are evaluated for 100 marks, and practicals/Laboratory Subjects are also Evaluated for 100 marks.

ii) For theory subjects, the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End-Examination. For the award of the 40 Internal (sessional) marks for theory subjects, there shall be 2 internal examinations during the Semester, one at the middle of the Semester and the other immediately after the completion of instruction; each of which shall be evaluated for 25 marks, and the better one out of these two internals shall be considered for awarding the 25 sessional marks. Out of the remaining 15 sessional marks, 5 marks are allocated for teacher’s assessment (allotment is based on performance of the student in the concerned subject/class) and 10 marks will be awarded based on the student’s performance in the Assignments.

iii) For practical’s/Laboratory subjects, there shall be a continuous evaluation during the Semester for 40 sessional marks and 60 End Examination marks. Of these 40 marks, 15 marks shall be awarded for day-to-day work and 25 marks to be awarded by conducting an internal laboratory test. The End Examination shall be conducted by the teacher concerned and another faculty member of the same Department, as suggested by the Head of Dept.

7.3 For M. Sc. (PG) part of the IDDMP at BTH, Sweden, the concerned subjects, regulations and evaluation procedure offered shall be as per the norms in vogue at BTH, Sweden.

7.4 Grading Procedure (Common for M. Tech. & M. Sc.)

i) Marks will be awarded to indicate the performance of each student in each Theory Subject or Practical or UG Project or comprehensive viva voce etc. at JNTUH as specified above in Items 7.1, 7.2, & 7.3 and a proportional letter grade shall be given.

ii) As a measure of the student’s performance, a Grading System using the following letter grades and corresponding percentage of marks shall be followed.

*For UG at JNTUH:

<table>
<thead>
<tr>
<th>% of Marks Secured at JNTUH</th>
<th>Letter Grade at JNTUH</th>
</tr>
</thead>
<tbody>
<tr>
<td>70% and above</td>
<td>A</td>
</tr>
<tr>
<td>Below 70% but not less than 60%</td>
<td>B</td>
</tr>
<tr>
<td>Below 60%</td>
<td>C</td>
</tr>
</tbody>
</table>
but not less than 50%
Below 50%
but not less than 40%
Below 40%

*For PG at JNTUH:

<table>
<thead>
<tr>
<th>% of Marks Secured at JNTUH</th>
<th>Letter Grade at JNTUH</th>
</tr>
</thead>
<tbody>
<tr>
<td>70% and above</td>
<td>A</td>
</tr>
<tr>
<td>Below 70%</td>
<td>B</td>
</tr>
<tr>
<td>but not less than 60%</td>
<td></td>
</tr>
<tr>
<td>Below 60%</td>
<td>C</td>
</tr>
<tr>
<td>but not less than 50%</td>
<td></td>
</tr>
<tr>
<td>Below 50%</td>
<td>F</td>
</tr>
</tbody>
</table>

*For PG at BTH, Sweden

<table>
<thead>
<tr>
<th>% of Marks Secured at JNTUH</th>
<th>Letter Grade Equivalent at BTH, Sweden</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than or equal to 100% and above</td>
<td>A</td>
</tr>
<tr>
<td>Below 90%</td>
<td>B</td>
</tr>
<tr>
<td>but not less than 90%</td>
<td></td>
</tr>
<tr>
<td>Below 80%</td>
<td>C</td>
</tr>
<tr>
<td>but not less than 80%</td>
<td></td>
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<tr>
<td>Below 70%</td>
<td>D</td>
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<td>but not less than 70%</td>
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<tr>
<td>Below 60%</td>
<td>E</td>
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<td>but not less than 60%</td>
<td></td>
</tr>
<tr>
<td>Below 50%</td>
<td>F</td>
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<tr>
<td>but not less than 50%</td>
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</table>

8) **Award of Degree or Class:**

After a student satisfies all the requirements prescribed for the completion of the IDDMP and becomes eligible for the award of the respective Degree, he shall be placed in one of the following four classes –

For UG at JNTUH:

<table>
<thead>
<tr>
<th>Class Awarded in UG Program</th>
<th>% of Marks Secured at JNTUH</th>
<th>Program Credits at JNTUH</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST CLASS with DISTINCTION</td>
<td>70% and above</td>
<td>From the Aggregate secured for the 174 UG credits.</td>
</tr>
<tr>
<td>FIRST CLASS</td>
<td>Below 70% but not less than 60%</td>
<td></td>
</tr>
<tr>
<td>SECOND CLASS</td>
<td>Below 60% but not less than 50%</td>
<td></td>
</tr>
<tr>
<td>PASS CLASS</td>
<td>Below 50% but not less than 40%</td>
<td></td>
</tr>
</tbody>
</table>

For PG:

<table>
<thead>
<tr>
<th>Class Awarded in PG at JNTUH</th>
<th>% of Marks Secured at JNTUH</th>
<th>Equivalence between BTH grade and JNTUH marks for the purpose of award of class</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIRST CLASS with DISTINCTION</td>
<td>70% and above</td>
<td>BTH Grade ≤ JNTUH Marks</td>
</tr>
</tbody>
</table>

A = 95%
<table>
<thead>
<tr>
<th>FIRST CLASS</th>
<th>B = 85%</th>
</tr>
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<tbody>
<tr>
<td>Below 70% but not</td>
<td>C = 75%</td>
</tr>
<tr>
<td>less than 60%</td>
<td></td>
</tr>
<tr>
<td>SECOND CLASS</td>
<td>D = 65%</td>
</tr>
<tr>
<td>Below 60% but not</td>
<td></td>
</tr>
<tr>
<td>less than 50%</td>
<td>E = 55%</td>
</tr>
<tr>
<td>FAIL</td>
<td>F &lt; 50%</td>
</tr>
<tr>
<td>Below 50%</td>
<td></td>
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</tbody>
</table>

# Note: If any unspecified symbol/character is given by BTH, Sweden as the ECTS grade for any subject the corresponding ratification for the appropriate specified grade shall be obtained from BTH, Sweden, and corresponding percentage marks will be awarded at JNTUH.

JNTUH awards the
- B. Tech. Degree with specialization in Mechanical Engineering after securing for 174 UG credits at JNTUH
- M. Tech. Degree with specialization in Structural Mechanics after securing a total of 80 PG credits (JNTUH) equivalent to 120 ECTS at BTH.

BTH awards the
- M. Sc. Degree in Electrical Engineering with emphasis on Structural Mechanics specialization after securing a total of 120 ECTS (BTH) equivalent to 80 PG credits at JNTUH.

9) **Transfer of Credits Policy between JNTUH and BTH, Sweden for awarding PG degrees:**
   a) JNTUH offers 20 credits for PG in IV Year I Semester for this Integrated Double Degree Masters program, which will be transferred to BTH as 30 credits of European Credit Transfer System (ECTS).
   b) The 30 ECTS offered in each Semester at BTH for PG in IV year II Semester, V year I and II Semesters are transferred to JNTUH, which will be equivalent to 20 credits at JNTUH.

10) **Withholding of Results:**
    If the student has not paid dues to University/College, or if any case of indiscipline is pending against him, the result of the candidate may be withheld and he will not be allowed to go into the next higher Semester. The award or issue of the Degree may also be withheld in such cases.

11) **Transitory Regulations:**
    Students who have discontinued or have been detained for want of attendance, or who have failed after having undergone the IDDMP, may be considered eligible for readmission to the same or equivalent subjects as and when they are offered, subject to Item 6.9 and 6.10.

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## MALPRACTICES RULES

<table>
<thead>
<tr>
<th>Nature of Malpractices</th>
<th>Punishment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>If the candidate:</strong></td>
<td><strong>Expulsion from the examination hall and cancellation of the performance in that subject only.</strong></td>
</tr>
<tr>
<td>1 (a) Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)</td>
<td></td>
</tr>
<tr>
<td>1 (b) Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.</td>
<td><strong>Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.</strong></td>
</tr>
<tr>
<td>2 Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.</td>
<td><strong>Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled.</strong></td>
</tr>
<tr>
<td>3 Impersonates any other candidate in connection with the examination.</td>
<td><strong>The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.</strong></td>
</tr>
<tr>
<td>4 Smuggles in the Answer book or</td>
<td><strong>Expulsion from the examination hall and</strong></td>
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<tr>
<td><strong>additional sheet or takes out or</strong></td>
<td><strong>cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.</strong></td>
</tr>
<tr>
<td><strong>arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>5</strong></td>
<td><strong>Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.</strong></td>
</tr>
<tr>
<td><strong>Cancellation of the performance in that subject.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>6</strong></td>
<td><strong>Refuses to obey the orders of the Chief Superintendent / Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.</strong></td>
</tr>
<tr>
<td><strong>In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>7</strong></td>
<td><strong>Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.</strong></td>
</tr>
<tr>
<td><strong>Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The</strong></td>
<td></td>
</tr>
<tr>
<td>Clause</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>8</td>
<td>Possess any lethal weapon or firearm in the examination hall.</td>
</tr>
<tr>
<td>9</td>
<td>If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.</td>
</tr>
<tr>
<td>10</td>
<td>Comes in a drunken condition to the examination hall.</td>
</tr>
<tr>
<td>11</td>
<td>Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.</td>
</tr>
<tr>
<td>12</td>
<td>If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the College / University for further action to award suitable punishment.</td>
</tr>
</tbody>
</table>

12) **General:**
- The Academic Regulations should be read as a whole for the purpose of any interpretation.
- The University/College reserves the right of altering the Academic Regulations and/or Syllabus/Course Structure, as and when necessary. The modifications or amendments may be applicable to all the candidates on rolls, as specified by the University/College.
- Wherever the words ‘he’ or ‘him’ or ‘his’ occur in the above regulations, they will also include ‘she’ or ‘her’ or ‘hers’.
- Wherever the word ‘Subject’ occurs in the above regulations, it implies the ‘Theory Subject’ and ‘Practical Subject’ or ‘Lab.’.
- In case of any ambiguity or doubt in the interpretations of the above regulations, the decision of the CAC / Academic Senate / Vice-Chancellor will be final.
- There shall be no branch transfers, no place transfers, no course transfers, and no transfers from 5 year IDDMP to 4 year B. Tech. (Regular) degree programme (Of same branch or any other branch) or Vice versa, after the completion of the admission process.
- The visa will be issued by the respective embassy, the student is required to fulfill the necessary norms. Students are responsible to show the required financial proofs to the migration authorities while applying for student permit (VISA). Either JNTUH or BTH will not be responsible for the visa rejections caused on the grounds of insufficient financial funds/statements or any other issues in front of Migration Board.

* * * * *
ACADEMIC REGULATIONS
COURSE STRUCTURE AND SYLLABUS

Mechanical Engineering
with Masters Specialization in
Structural Mechanics

For

FIVE YEAR INTEGRATED
DOUBLE DEGREE MASTERS PROGRAM (IDDMP)
Leading to B.Tech., M.Tech. at JNTUH and
M. Sc. at Blekinge Institute of Technology, Sweden

(Applicable for the Batches admitted from 2014-2015)
# JNTUH COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)

## MECHANICAL ENGINEERING

### COURSE STRUCTURE
( applicable from the batch admitted during 2014-15 and onwards)

### I YEAR

#### I SEMESTER

<table>
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<tr>
<th>S.No.</th>
<th>Group</th>
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<th>Credit</th>
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**NSS / NCC**  
**Total Credits**  
26

#### II SEMESTER

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**NSS/NCC**  
**Total Credits**  
28
## MECHANICAL ENGINEERING

### COURSE STRUCTURE

#### I YEAR I SEMESTER

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<th>Credit</th>
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#### II YEAR II SEMESTER

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### JNTUH COLLEGE OF ENGINEERING HYDERABAD (AUTONOMOUS)

#### MECHANICAL ENGINEERING

### COURSE STRUCTURE

#### III YEAR

<table>
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<tr>
<th>S.No.</th>
<th>Group</th>
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**TOTAL** 26

#### III YEAR

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**TOTAL** 28

*Summer between III & IV Year: UG Project: 4 credits*
*(UG Project continued into IV year I semester)*
# MECHANICAL ENGINEERING

## COURSE STRUCTURE

### IV YEAR

#### I SEMESTER

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<td>PG Elective-I (Industrial Robotics)</td>
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(* 4 credits for the UG project carried out during the summer after 3rd Year –II Semester).

### IV-II AND V-I & II Semesters at BTH Sweden

Each Semester in BTH-Sweden, is divided into two Groups (LP1&LP2 in IV-II semester, LP3 & LP4 in V-I Semester and V-II Semester Project work). Students have to take only 2 subjects per Learning Period (LP) each subject with 7.5 ECTS. Total of 4x7.5=30 ECTS per Semester and 90 ECTS at BTH. The subjects will be notified at the time of entry to the semester.

### Open Elective-I

<table>
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<td>Civil Engineering</td>
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<tr>
<td>2</td>
<td>Non Conventional Power Generation</td>
<td>Electrical &amp; Electronics Engineering</td>
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<tr>
<td>3</td>
<td>Operations Research</td>
<td>Mechanical Engineering</td>
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<tr>
<td>4</td>
<td>Electronic Measurements &amp; Instrumentation</td>
<td>Electronics &amp; Communication Engineering</td>
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<tr>
<td>S.No.</td>
<td>Subject</td>
<td>Offering Department</td>
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<td>1.</td>
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<td>2.</td>
<td>Energy Storage Systems</td>
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<tr>
<td>3.</td>
<td>Mechatronics</td>
<td>Mechanical Engineering</td>
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<td>E-Commerce</td>
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<tr>
<td>10.</td>
<td>Entrepreneurship</td>
<td>Humanities &amp; Social Sciences</td>
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**Departmental Elective-I**
1. Automobile Engineering  
2. Non-Conventional Sources of Energy  
3. Tribology  
4. Neural networks & fuzzy logics  
5. Plant Layout and Material Handling

**Departmental Elective-II**
1. Power Plant Engineering  
2. Advanced Mechanics of Composite Materials  
3. Production Planning & Control  
4. Modern Control Theory  
5. Fluid Power Systems

**PG Elective-I**
1. Industrial Robotics  
2. Fracture Mechanics  
3. Experimental stress Analysis  
4. Advanced Mechanics of solids

**PG Elective-II**
1. Mechatronics  
2. Vehicle Dynamics  
3. Random Vibrations  
4. Theory of elasticity

## COURSES OFFERED AT  
BLEKINGE INSTITUTE OF TECHNOLOGY, SWEDEN  
(FROM IV –II SEMESTER ONWARDS)

### IV-II AND V-I & II Semester Courses at BTH Sweden  
a) The courses offered by Blekinge Institute of Technology, Sweden from IV-II semester onwards  

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<th>I Semester</th>
<th>I Study Period</th>
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<td>5.</td>
<td>Mandatory 5</td>
<td>Computational Engineering 2* (Continued...)</td>
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<td>6.</td>
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<td>Experimental Model Analysis</td>
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### List of elective courses for Elective 1 Course:

The students are expected to study one Elective Courses from the eligible courses provided in the list, corresponding to 7.5 ECTS credits.

- Fracture Mechanics, 7.5
- Optimisation, 7.5
- Physical Acoustics, 7.5

b) The courses for IV-I Semester of IDDMP to be included in Master's degree at BTH:

c) In order to qualify for a 120 credits Master's degree from BTH, the following below courses (1-5)

   from IV-I semester of IDDMP Program of JNTUH will be considered for crediting to Master's programs for the award of Masters degree at BTH and will be treated as 30 ECTS Credits.

1. PGC : Signal Processing
2. PGE : Mechatronics
3. PGE : Industrial Robotics
4. PGC : Structural Mechanics and Robotics Lab
5. PGC : Comprehensive Viva-Voce
6. UGC : Bachelors Project (Continued... from summer period between III-II and IV-I Semester)

d) The courses of Bachelor education as per the curricula of first year, second year and third year and undergraduate project of IDDMP as prerequisites background for masters education at BTH.

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1 Eligible Courses will be offered to student as per the availability of resources.
2 UG Project will be only considered for bachelor education.
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MATHEMATICS-I
(Common for all Branches)

UNIT – I: Differential calculus
Rolle’s Mean value Theorem – Lagrange’s Mean Value Theorem – Cauchy’s mean value Theorem – (all theorems without proof but with geometrical interpretations), verification of the Theorems and testing the applicability of these theorem to the given function. Radius, Center and circle of curvature – Evaluates and Envelopes, Curve tracing – Cartesian, polar and parametric curves.

Functions of several variables – Functional dependence- Jacobian- Maxima and Minima of functions of two variables with constraints and without constraints-Method of Lagrange multipliers.

UNIT – II: Improper Integrals, Multiple Integration
Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions
Multiple integrals – double and triple integrals – change of order of integration- change of variables (polar, cylindrical and spherical) Finding the area of a region using Double integration and volume of a region in space using triple integration.

UNIT – III: Vector Calculus

UNIT – IV: First Order Ordinary Differential Equations
Overview of differential equations- exact, linear and Bernoulli.

UNIT V: Higher Order Ordinary Differential Equations
Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of the type f(x)= e^{ax}, Sin ax, Cos ax, and x^n, e^{ax} V(x), x^n V(x), method of variation of parameters. Applications on bending of beams, Electrical circuits and simple harmonic motion.

TEXT BOOKS:

1. HIGHER ENGINEERING MATHEMATICS BY B S GREWAL.
2. ADVANCED ENGINEERING MATHEMATICS BY PETER V O’NEIL, CENGAGE LEARNING
3. ENGINEERING MATHEMATICS BY ERWIN KREYSZIG,10TH EDITION WIELY PUBLICATIONS

REFERENCES:
1. MATHEMATICS FOR ENGINEERS BY K.B.DATTERY AND M.A S.SRINIVAS, CENGAGE PUBLICATIONS
2. MATHEMATICS FOR ENGINEERS BY PROF.A R K PRASAD., WIELY INDIA.
3. ENGINEERING MATHEMATICS -1AND 2 BYT.K.V.IYENGAR & B.KRISHNA GANDHI et al
UNIT-I
1. **Interference**: Superposition of Waves, Young’s double slit experiment, Coherence, Interference in Thin films by Reflection, Newton’s Rings.
3. **Polarization**: Introduction to polarization, Double Refraction, Nicol Prism, Quarter and Half wave plates

UNIT-II
5. **Crystallography and Crystal Structures**: Space Lattice, Unit Cell, Lattice parameters, Crystal Systems, Bravais Lattices, Miller Indices, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Diamond Structure(Cubic), Structures of NaCl, ZnS, CsCl, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems

UNIT-III

UNIT-IV
10. **Superconductivity**: Introduction of Superconductivity, Properties of Superconductors, Meissner Effect, BCS theory (Qualitative), Type-I and Type II Superconductors, Magnetic Levitation and Applications of Superconductors.

UNIT-V
12. **Nanomaterials**: Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-Gel, Precipitation, combustion Methods; Top-Down Fabrication: Chemical Vapor Deposition, Physical Vapor Deposition, Characterization Techniques (XRD, SEM &TEM) and Applications.

Text books:
2. Introduction to Solid State Physics by Charles Kittel, Wiley India Pvt Ltd, 7th Edition
4. Solid State Physics by A J Dekker, MACMILLAN INDIA LTD.

References:
1. Modern Engineering Physics by Dr.K.Vijaya Kumar, Dr.S.Chandralingam, S.CHAND & COMPANY LTD
4. Introduction to Nanotechnology by Charles P.Poole, Jr.Frank J ownes, John Wiley & Sons
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APPLIED CHEMISTRY

Unit-I: Water and its treatment:

Unit-II: Electrochemistry and corrosion:


Unit-III: High Polymers:
Definition – Classification of polymers with examples – Types of polymerisation – Chain growth (free radical addition mechanism), step growth polymerization, coordination polymerization. Plastics, fibres and elastomers - definition and characteristics. Plastics – thermoplastic and thermosetting plastics, constituents of plastics . Fibre reinforced plastics. Preparation, properties and applications of PVC, Teflon, Bakelite, Nylon 6:6 and terylene (Dacron); Rubber – Natural rubber , its processing and vulcanization. Elastomers: Preparation, properties and applications of Styrene butadiene, butyl and thiokol rubbers. Conducting polymers – Classification with examples; mechanism of conduction in trans-polyacetylene and applications of conducting polymers. Biodegradable polymers – concept and advantages - Polylactic acid and polyvinyl alcohol and their applications.

Unit-IV: Chemistry of Energy sources:
Alternate Energy sources: Biodiesel - trans-esterification - advantages of biodiesel, fuel cells (H₂-O₂ and Methanol –O₂ fuel cell) – Photovoltaic cells.

Unit-V: Engineering Materials:
Refractories – Characteristics of a good refractory, classification with examples – refractoriness and refractoriness under load - causes for the failure of refractories.
Abrasives: Characteristics – Classification and applications of Diamond and Carborundum (SIC)
Nanomaterials: Introduction - Preparation of nanomaterials by top down and bottom up approaches - applications of nanomaterials.

Text Books:

Reference Books:
JNTUH COLLEGE OF ENGINEERING HYDERABAD


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COMPUTER PROGRAMMING AND DATA STRUCTURES

Objectives:
- To understand the various steps in Program development.
- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs
- To understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data structures.
- To understand the notations used to analyze the Performance of algorithms.
- To understand the behavior of data structures such as stacks, queues,
- To understand and analyze various searching and sorting algorithms.
- To write programs in C to solve problems using data structures such as arrays, linked lists,

UNIT - I

Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

Selection Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.

UNIT - II
Designing Structured Programs- Functions, basics, user defined functions, inter function communication,

Standard functions- Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programs

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples.

UNIT - III
Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

UNIT - IV
Derived types – Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

Input and Output – Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C program examples.

UNIT – V
Sorting- selection sort, bubble sort, insertion sort,
Searching-linear and binary search methods.
**Data Structures** – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

**TEXT BOOKS:**
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

**REFERENCES:**
6. C Programming & Data Structures,E.Balagurusamy,TMH.
7. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
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ENGINEERING MECHANICS


2. **Friction**: Types of friction - Limiting friction - Laws of Friction - static and Dynamic Frictions - Motion of Bodies - Wedge Screw, Screw-jack and differential screw - jack

3. **Centroid and Center of Gravity**: Introduction – Centroids of lines – Centroids of area - Centroids of Composite figures - Theorem of Pappus - Centre of Gravity of Bodies – Centroids of Volumes – Center of gravity of composite bodies.


**TEXT BOOKS**:


2. Engg. Mechanics / Timoshenko & Young

**REFERENCES**:


LIST OF EXPERIMENTS
1. Dispersive power of the material of a prism – Spectrometer
4. Time constant of an R-C Circuit.
5. Magnetic field along the axis of current carrying coil - Stewart and Gee’s method.
8. Torsional pendulum.
10. Diffraction grating using single slit - Laser source
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APPLIED CHEMISTRY LAB

LIST OF EXPERIMENTS
1) Estimation of ferrous iron by Permanganometry.
2) Estimation of ferric iron by Dichrometry,
3) Estimation of copper by Iodometry.
4) Estimation of Fe$^{2+}$ & Fe$^{3+}$ by dichrometry.
5) Estimation of hardness of water by Complexometry using EDTA,
6) Estimation of copper by Complexometry using EDTA.
7) Estimation of alkalinity of water.
8) Estimation of Permanent hardness by EDTA
9) Preparation of Thikol rubber.
10) Estimation of iron in cement by Colorimetry; KMnO$_4$
11) Estimation of Mn in KMnO$_4$ by Colorimetry;
12) Estimation of HCl in a given solution by pH - metry.
13) Estimation of HCl in acid mixture by conductometry.
14) Estimation of Fe$^{2+}$ by Potentiometry.

Recommend Books:

Objectives:
- To understand the various steps in Program development.
- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs
- To understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data structures.
- To understand the notations used to analyze the Performance of algorithms.
- To understand the behavior of data structures such as stacks, queues,
- To understand and analyze various searching and sorting algorithms.
- To write programs in C to solve problems using data structures such as arrays, linked lists,

1. Write a C program to find the sum of individual digits of a positive integer.

2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

4. Write a C program to find the roots of a quadratic equation.

6. Write a C program to find the factorial of a given integer.

7. Write a C program to find the GCD (greatest common divisor) of two given integers.

8. Write a C program to solve Towers of Hanoi problem.

9. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

10. Write a C program to find both the largest and smallest number in a list of integers.

11. Write a C program that uses functions to perform the following:
   i) Addition of Two Matrices
   ii) Multiplication of Two Matrices

12. Write a C program that uses functions to perform the following operations:
   i) To insert a sub-string in to a given main string from a given position.
   ii) To delete n Characters from a given position in a given string.

13. Write a C program to determine if the given string is a palindrome or not
14. Write a C program that displays the position or index in the string S where the string T begins, or \(-1\) if S doesn’t contain T.

15. Write a C program to count the lines, words and characters in a given text.

16. Write a C program to generate Pascal’s triangle.

17. Write a C program to construct a pyramid of numbers.

18. Write a C program that uses functions to perform the following operations:
   i) Reading a complex number
   ii) Writing a complex number
   iii) Addition of two complex numbers
   iv) Multiplication of two complex numbers
   (Note: represent complex number using a structure.)

19. i) Write a C program which copies one file to another.
    ii) Write a C program to reverse the first n characters in a file.
    (Note: The file name and n are specified on the command line.)

20. i) Write a C program to display the contents of a file.
    ii) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

21. Write a C program that uses functions to perform the following operations on singly linked list:
   i) Creation    ii) Insertion    iii) Deletion    iv) Traversal

22. Write C programs that implement stack (its operations) using
   i) Arrays    ii) Pointers

23. Write C programs that implement Queue (its operations) using
   i) Arrays    ii) Pointers

24. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Bubble sort
   ii) Selection sort

25. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
   i) Linear search    ii) Binary search
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MATHEMATICS-II

UNIT – I: Linear ODE with variable coefficients and series solutions (second order only)
Equations reducible to constant coefficients-Cauchy’s and Lagrange’s differential equations
Motivation for series solutions, Ordinary point and Regular singular point of a differential equation,
Transformation of non-zero singular point to zero singular point. Series solutions to
differential equations around zero, Frobenius Method about zero.

UNIT-II: Special Functions
Legendre’s Differential equation, General solution of Legendre’s equation, Legendre polynomials
Properties: Rodrigue’s formula – Recurrence relations, Generating function of
Legendre’s polynomials – Orthogonality.
Bessel’s Differential equation, Bessel functions properties: – Recurrence relations,
Orthogonality, Generating function, Trigonometric expansions involving Bessel functions.

UNIT-III: Partial Differential Equations
Introduction and Formation of partial differential equation by elimination of arbitrary
constants and arbitrary functions, solutions of first order linear (Lagrange) equation and non-linear
equations (Charpit’s method), Method of separation of variables for second order
equations –Applications of Partial differential equations-Two dimensional wave equation.,
Heat equation.

UNIT – IV: Laplace Transform
Definition of Integral transform. Domain of the function and Kernel for the Laplace transforms,
Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when
they are multiplied or divided by “t”. Laplace transforms of derivatives and integrals of functions. – Unit step function – second shifting theorem –
Dirac’s delta function, Periodic function – Inverse Laplace transform by Partial fractions(Heaviside method) Inverse Laplace transforms of functions when they are multiplied or
divided by ”s”, Inverse Laplace Transforms of derivatives and integrals of functions,
Convolution theorem-solving differential equations by Laplace transforms

UNIT – V: Fourier Series and Fourier Transforms
Definition of periodic function. Fourier expansion of periodic functions in a given interval of
length, $2\pi$, Determination of Fourier coefficients – Fourier series of even and odd functions –
Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range
Fourier sine and cosine expansions. Fourier integral theorem – Fourier sine and cosine
integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse
transforms – Finite Fourier transforms.

TEXT BOOKS:

1) HIGHER ENGINEERING MATHEMATICS BY B S GREWAL.
2) ADVANCED ENGINEERING MATHEMATICS BY PETER V O’NEIL,
   CENGAGE LEARNING
3) ENGINEERING MATHEMATICS BY ERWIN KREYSZIG, 10TH EDITION WIELY
   PUBLICATIONS

REFERENCES:

1) MATHEMATICS FOR ENGINEERS SERIES- ADVANCED MATHEMATICS FOR
   ENGINEERS BY K.B.DATTA AND M.A S.SRINIVAS, CENGAGE PUBLICATIONS
2) ADVANCED ENGINEERING MATHEMATICS FOR ENGINEERS BY PROF.A R K
   PRASAD., WIELY INDIA
3) ADVANCED ENGINEERING MATHEMATICS BY SAHANAZ BATHUL, PHI PUBLICATION
4) ENGINEERING MATHEMATICS-3 BY T.K.V.IYENGAR &B.KRISHNA GANDHI ETC
5) COMPLEX VARIABLES PRINCIPLES AND PROBLEM SESSIONS BY A.K.KAPOOR, WORLD SCIENTIFIC PUBLISHERS
6) A TEXT BOOK OF ENGINEERING MATHEMATICS BY N P BALI, MANESH GOYAL
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BASIC ELECTRICAL & ELECTRONICS ENGINEERING

UNIT- I ELECTRICAL and SINGLE PHASE AC CIRCUITS


UNIT- II RESONANCE and NETWORK THEOREMS

Resonance – Series resonance and Parallel resonance circuits, concept of bandwidth and Q factor, Locus Diagrams for RL, RC and RLC Combinations for Various Parameters.

Network Theorems - Thevenin’s, Norton’s, Maximum Power Transfer, Superposition, Reciprocity, Tellegen’s, Millman’s and Compensation theorems for DC and AC excitations.

UNIT- III P-N JUNCTION DIODE & DIODE CIRCUITS

P-N Junction Diode - Diode equation, Energy Band diagram, Volt-Ampere characteristic, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances.

Rectifiers and Filters - The P-N junction as a rectifier - A Half Wave Rectifier, Ripple Factor, Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

UNIT- IV BIPOLAR JUNCTION TRANSISTOR


Transistor Biasing And Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias stability, Stabilization against variations in \( V_{BE} \) and \( \beta \), Bias Compensation using Diodes and Transistors.

Transistor Configurations - BJT modeling, Hybrid model, Determination of h-parameters from transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters, Comparison of CE, CB and CC configurations.

UNIT- V JUNCTION FIELD EFFECT TRANSISTOR & SPECIAL PURPOSE DEVICES:

Junction Field Effect Transistor - Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Small Signal Model, Biasing FET.

Special Purpose Devices - Breakdown Mechanisms in Semi Conductor Diodes, Zener diode characteristics, Use of Zener diode as simple regulator Principle of operation and Characteristics of Tunnel Diode (With help of Energy band diagram) and Varactor Diode, Principle of Operation of SCR.

TEXT BOOKS:

REFERENCES:
1. Introduction to Electronic Devices and Circuits - Rober T. Paynter, Pearson Education.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
ENGLISH

1. INTRODUCTION:
In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students. The prescribed books and the exercises are meant to serve broadly as students’ handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure. Hence, it is suggested that they read it on their own the topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc. However, the stress in this syllabus is on skill development, fostering ideas and practice of language skills.

2. OBJECTIVES:
- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.
- To develop the study skills and communication skills in formal and informal situations.

Learning Outcomes
- Usage of correct English Language, written and spoken
- Enrichment of comprehension and fluency
- Gaining Confidence in using language in varied situations

SYLLABUS:

Listening Skills:
Objectives
1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language to be able to recognise them, to distinguish between them to mark stress and recognise and use the right intonation in sentences.
- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information
Speaking Skills:
Objectives
1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.
   - Oral practice
   - Describing objects/situations/people
   - Role play – Individual/Group activities (Using exercises from all the six units of the prescribed text: *Skills Annexe: Functional English for Success*.)
   - Just A Minute (JAM) Sessions.

Reading Skills:
Objectives
To develop an awareness in the students about the significance of silent reading and comprehension.
1. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.
   - Skimming the text
   - Understanding the gist of an argument
   - Identifying the topic sentence
   - Inferring lexical and contextual meaning
   - Understanding discourse features
   - Scanning
   - Recognizing coherence/sequencing of sentences

NOTE: The students will be trained in reading skills using the prescribed text for detailed study. They will be examined in reading and answering questions using ‘unseen’ passages which may be taken from authentic texts, such as magazines/newspaper articles.

Writing Skills:
Objectives
1. To develop an awareness in the students about writing as an exact and formal skill
2. To equip them with the components of different forms of writing, beginning with the lower order ones.

Writing sentences
- Use of appropriate vocabulary
- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Note Making
- Formal and informal letter writing
- Describing graphs using expressions of comparison

4. TEXTBOOKS PRESCRIBED:
In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts are prescribed:

*For Detailed study*
1. First Text book entitled “Skills Annexe - Functional English for Success”, Published by Orient Black Swan, Hyderabad

The course content and study material is divided into **Five Units.**

**Unit –I:**
1. Chapter entitled ‘Wit and Humour’ from ‘Skills Annexe’ -Functional English to Success Published by Orient Black Swan, Hyderabad
2. Chapter entitled ‘Mokshagundam Visvesvaraya’ from “Epitome of Wisdom”, Published by Maruthi Publications, Hyderabad.

L-Listening For Sounds, Stress and Intonation
S-Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations)
R- Reading for Subject/ Theme
W- Writing Paragraphs
G-Types of Nouns and Pronouns
V- Homonyms, homophones synonyms, antonyms

**Unit –II**
1. Chapter entitled “Advances in Science and Technology” from “Skills Annexe - Functional English for Success” Published by Orient Black Swan, Hyderabad.
2. Chapter entitled ‘Three days To See’ from “Epitome of Wisdom”, Published by Maruthi Publications, Hyderabad.

L – Listening for themes and facts
S – Apologizing, interrupting, requesting and making polite conversation
R- for theme and gist
W- Describing people, places, objects, events
G- Verb forms
V- Noun, verb, adjective and adverb

**Unit –III**
1. Chapter entitled ‘Risk Management’ from “Skills Annexe -Functional English for Success” Published by Orient Black Swan, Hyderabad
2. Chapter entitled ‘Leela’s Friend’ by R.K. Narayan from “Epitome of Wisdom”, Published by Maruthi Publications, Hyderabad

L – for main points and sub-points for note taking
S – Giving instructions and directions; Speaking of hypothetical situations
R – Reading for details
W – Note-making, information transfer, punctuation
G – Present tense
V – Synonymys and Antonyms

**Unit –IV**
1. Chapter entitled ‘Human Values and Professional Ethics’ from “Skills Annexe - Functional English for Success” Published by Orient Black Swan, Hyderabad
2. Chapter entitled ‘The Last Leaf’ from “Epitome of Wisdom”, Published by Maruthi Publications, Hyderabad
L- Listening for specific details and information  
S- Narrating, expressing opinions and telephone interactions  
R -Reading for specific details and information  
W- Writing formal letters and CVs  
G- Past and future tenses  
V- Vocabulary - idioms and Phrasal verbs  

Unit –V  
1. Chapter entitled ‘Sports and Health’ from “Skills Annexe -Functional English for Success” Published by Orient Black Swan, Hyderabad  
2. Chapter entitled ‘The Convocation Speech’ by N.R. Narayanmurthy from “Epitome of Wisdom”, Published by Maruthi Publications, Hyderabad  

and  

L- Critical Listening and Listening for speaker’s tone/ attitude  
S- Group discussion and Making presentations  
R- Critical reading, reading for reference  
W-Project proposals; Technical reports, Project Reports and Research Papers  
G- Adjectives, prepositions and concord  
V- Collocations and Technical vocabulary and using words appropriately  

* Exercises from the texts not prescribed shall also be used for classroom tasks.  

SUGGESTED READING:  
5. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson  
8. Technical Communication, Meenakshi Raman, Oxford University Press  
9. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education  
11. Murphy’s English Grammar with CD, Murphy, Cambridge University Press.  
12. Everyday Dialogues in English, Robert J. Dixon, Prentice Hall India Pvt Ltd.,  
14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education  
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,  
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ENGINEERING GRAPHICS

Pre-requisite: Nil

Objective: The objective of this subject is to provide the basic concepts about Engineering Drawing. Detailed concepts are given in projections, technical drawing, dimensioning and specifications.

Codes / Tables: Nil

Question Paper Pattern:
5 Questions to be answered out of 8 questions.
Each question should not have more than 3 bits.

UNIT – I
INTRODUCTION TO ENGINEERING DRAWING:

UNIT – II
ORTHOGRAPHIC PROJECTIONS:

UNIT – III
Projections of Regular Solids – Auxiliary Views.

UNIT – IV
Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere. Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone

UNIT – V
ISOMETRIC PROJECTIONS:

TEXT BOOKS:
1. Engineering Drawing N.D. Bhatt / Charotar

REFERENCE BOOKS:
1. A Text Book of Engineering Drawing / Dhawan R K / S. Chand
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ENVIRONMENTAL SCIENCE

UNIT - I
MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: Definition, Scope and Importance – Need for Public Awareness.
NATURAL RESOURCES: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT - II
ECOSYSTEMS: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem:
a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT - III

UNIT - IV
ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of :
a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and
industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

UNIT - V


FIELD WORK : Visit to a local area to document environmental assets River / forest grassland/hill/mountain - Visit to a local polluted site - Urban/Rural/industrial/ Agricultural Study of common plants, insects, birds. - Study of simple ecosystems pond, river, hill slopes, etc.

TEXT BOOK:
1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission., Universities Press
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE:
1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.
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COMPUTATIONAL MATHEMATICS

UNIT-I: Matrices and Linear Transformations:

UNIT – II: Interpolation and Curve fitting:
Curve fitting: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.

UNIT – III : Numerical techniques:
Solution of Algebraic and Transcendental Equations and Linear system of equations.

UNIT- IV: Numerical Differentiation, Integration, and Numerical solutions of First order differential equations:

UNIT – V:

Text Books:
1) INTRODUCTORY METHODS OF NUMERICAL ANALYSIS BY SS SASTRY
2) NUMERICAL AND STATISTICAL METHODS WITH PROGRAMMING IN C BY SUJATHA SINHA AND SUBHABRADA DINDA, SCITEC PUBLISHERS

References:
1) ADVANCED ENGINEERING MATHEMATICS BY ALAN JEFFERY
2) APPLIED NUMERICAL METHODS USING MATLAB BY RAO.V.DUKKIPATI, NEW AGE PUBLISHERS
3) NUMERICAL METHODS IN SCIENCE AND ENGINEERING – A PRACTICAL APPROACH BY S. RAJASEKHARAN, S. CHAND PUBLICATIONS
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ENGINEERING WORKSHOP

I. TRADES FOR EXERCISES:
   (Any six trades from the following with minimum of two exercises in each trade)
   1. Carpentry
   2. Fitting
   3. Tin-Smithy
   4. Black Smithy
   5. House-wiring
   6. Foundry
   7. Plumbing

II. Trades for Demonstration & Exposure
   1. Demonstration of power tools & wiring
   2. Welding
   3. Machine Shop

III. IT Workshop I: Computer hardware, identification of parts, Disassembly, Assembly of computer to working condition, simple diagnostic exercises.
    IT Workshop II: Installation of operating system windows and linux simple diagnostic exercises.
ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

The Language Lab focuses on the production and practice of sounds of language and familiarises the students with the use of English in everyday situations and contexts.

Objectives

- To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
- To sensitise the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

Learning Outcomes

- Better Understanding of nuances of language through audio-visual experience and group activities
- Neutralization of accent for intelligibility
- Speaking with clarity and confidence thereby enhancing employability skills of the students

Syllabus:

English Language Communication Skills Lab shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

The following course content is prescribed for the English Language Communication Skills Lab

Exercise – I

CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants
ICS Lab: Ice-Breaking activity and JAM session
Articles, Prepositions, Word Formation- Prefixes & Suffixes, Synonyms & Antonyms

Exercise – II

CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.
Concord (Subject in agreement with verb) and Words often misspelt- confused/misused

Exercise - III

CALL Lab: Minimal Pairs- Word Accent and Stress Shifts- Listening Comprehension.
ICS Lab: Descriptions- Narrations- Giving Directions and Guidelines.
Sequence of Tenses, Question Tags and One Word Substitutes.
Exercise – IV
CALL Lab: Intonation and Common errors in Pronunciation.
ICS Lab: Extempore- Public Speaking
Active and Passive Voice, –Common Errors in English, Idioms and Phrases

Exercise – V
CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice
ICS Lab: Information Transfer- Oral Presentation Skills
Reading Comprehension and Job Application with Resume preparation.

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The Computer Aided Language Lab for 40 students with 40 systems, one master console, LAN facility and English language software for self-study by learners.

System Requirement (Hardware component):
Computer network with Lan with minimum 60 multimedia systems with the following specifications:

   i) P – IV Processor
      a) Speed – 2.8 GHZ
      b) RAM – 512 MB Minimum
      c) Hard Disk – 80 GB
   ii) Headphones of High quality

2. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.


In addition to the prescribed lab manual, all the listening and speaking activities mentioned in Text-1 and Text-2 can be conducted in the English Language Communication Skills Lab.

Suggested Software:

- Cambridge Advanced Learners’ English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley
- Punctuation Made Easy by Darling Kindersley
- Clarity Pronunciation Power – Part I
- Clarity Pronunciation Power – part II
- Oxford Advanced Learner’s Compass, 8th Edition
- DELTA’s key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dreamtech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge
SUGGESTED READING:
4. Sasi Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
11. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.

DISTRIBUTION AND WEIGHTAGE OF MARKS

English Language Laboratory Practical Examination:
1) The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2) For the Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 year-end Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year-end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.
Interpolation: Programming Tasks:

1. A) Write a C program to determine y for a given x, if two arrays of x and y of same size are given (using Newton’s interpolation both forward and backward).
   B) Write a C program to determine y for a given x, if two arrays of x and y of same size are given (using Lagrange’s interpolation).
   C) Write a C program to determine y for a given x, if two arrays of x and y of same size are given (using Gauss interpolation).
   (Selection criteria of the interpolation formula are important.)

Curve fitting: Programming Tasks:

2. A) Write a C program to find a line of best fit from the given two arrays of x and y of same size.
   B) Write a C program to find a curve of the form \( y = Ae^{Bx} \) from the given two arrays of x and y of same size.
   C) Write a C program to find a curve of the form \( y = Ax^n \) from the given two arrays of x and y of same size.
   D) Write a C program to find a curve of the form \( y = Ax^2 + Bx + C \) from the given two arrays of x and y of same size.

Solution of Algebraic and Transcendental Equations: Programming Tasks:

3. A) Write a C program to find the root of a given equation using bisection method.
   (Write this program such that the initial values given to the system are not usable, then the system should ask us to give new set of initial values)
   B) Write a C program to find the root of a given equation using method of false position (regula false position).
   C) Write a C program to find the root of a given equation using iteration method.
   D) Write a C program to find the root of a given equation using Newton Raphson method.

Linear system of equations: Programming Tasks:

4. A) Write a C program to find the solution of given system of linear equations using L-U decomposition method.
   B) Write a C program to find the solution of given system of linear equations using Jacobi’s method.
   C) Write a C program to find the solution of given system of equations using Gauss Sidel iteration method.
   D) Write a C program to find the solution of given system of equations using Gauss Jordan elimination method.

Numerical Differentiation, Integration, and Numerical solutions of First order differential equations: Programming Tasks:

5. A) Write a C program to evaluate definite integral using trapezoidal rule, Simpson’s 1/3rd rule and 3/8th rule.
   B) Write a C program to solve a given differential equation using Taylor’s series.
   C) Write a C program to solve a given differential equation Euler’s and modified Euler’s method.
   D) Write a C program to solve a given differential equation using Runge-Kutta method.
Text Books:

1) INTRODUCTORY METHODS OF NUMERICAL ANALYSIS BY SS SASTRY
2) NUMERICAL AND STATISTICAL METHODS WITH PROGRAMMING IN C BY SUJATHA SINHA AND SUBHABRADA DINDA, SCITEC PUBLISHERS

References:

1) ADVANCED ENGINEERING MATHEMATICS BY ALAN JEFFERY
2) APPLIED NUMERICAL METHODS USING MATLAB BY RAO.V.DUKKIPATI,NEW AGE PUBLISHERS
3) NUMERICAL METHODS IN SCIENCE AND ENGINEERING –APRACTICAL APPROACH BY S.RAJASEKHARAN, S.CHAND PUBLICATIONS
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MATHEMATICS – III

UNIT-I: Single Random variables and probability distributions.

UNIT-II: Multiple Random variables, Correlation & Regression
Joint probability distributions- Joint probability mass / density function, Marginal probability mass / density functions, Covariance of two random variables, Correlation -Coefficient of correlation. The rank correlation. Regression- Regression Coefficient, The lines of regression and multiple correlation & regression.

UNIT-III: Sampling Distributions and Testing of Hypothesis
Sampling: Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance.
Parameter estimations – likelihood estimate, interval estimations.
Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, Level of significance. One sided test, Two sided test,

Large sample tests:
(i) Test of Equality of means of two samples equality of sample mean and population mean (cases of known varience & unknown varience, equal and unequal variances)
(ii) Tests of significance of difference between sample S.D and population S.D.
(iii) Tests of significance difference between sample proportion and population proportion & difference between two sample proportions.

Small sample tests:
Student t-distribution,its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples Snedecor’s F- distribution and it’s properties. Test of equality of two population variances Chi-square distribution , it’s properties, Chi-square test of goodness of fit.

UNIT-IV: Functions of Complex Variables
Radius of convergence – Expansion in Taylor’s series, Maclaurin’s series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity

UNIT – V: Contour Integration
Evaluation of integrals of the type

(a) Improper real integrals \[\int_{-\infty}^{\infty} f(x)dx\]  
(b) \[\int_{c}^{c+2\pi} f(\cos \theta, \sin \theta) d\theta\]

**Conformal mapping.**
Transformation of z-plane to w-plane by a function, Conformal transformation. Standard transformations- Translation; Magnification and rotation; inversion and reflection, Transformations like \(e^z\), \(\log z\), \(z^2\), and Bilinear transformation. Properties of Bilinear transformation, determination of bilinear transformation when mappings of 3 points are given.

**Text Books:**

1) **FUNDAMENTALS OF MATHEMATICAL STATISTICS** BY S C GUPTA AND V.K.KAPOOR
2) **PROBABILITY AND STATISTICS FOR ENGINEERS AND SCIENTISTS** BY SHELDON M.ROSS,ACADEMIC PRESS
3) **PROBABILITY AND STATISTICS FOR ENGINEERING AND THE SCIENCCE** BY JAY L.DEVORE.
4) **HIGHER ENGINEERING MATHEMATICS** BY B S GREWAL.
5) **ADVANCED ENGINEERING MATHEMATICS** BY PETER V O’NEIL, CENGAGE LEARNING
6) **ENGINEERING MATHEMATICS** BY ERWIN KREYSZIG,10TH EDITION WIELY PUBLICATIONS

**References:**

1) **MATHEMATICS FOR ENGINEERS SERIES –PROBABILITY STATISTICS AND STOCHASTIC PROCESS** BY K.B.DATTA AND M.A S.SRINIVAS,CENGAGE PUBLICATIONS
2) **PROBABILITY, STATISTICS AND STOCHASTIC PROCESS** BY PROF.A R K PRASAD., WIELY INDIA
3) **ADVANCED ENGINEERING MATHEMATICS** BY SAHANAZ BATHUL, PHI PUBLICATION
4) **PROBABILITY AND STATISTICS** BY T.K.V.IYENGAR &B.KRISHNA GANDHI etel
5) **MATHEMATICS FOR ENGINEERS SERIES- ADVANCED MATHEMATICS FOR ENGINEERS** BY K.B.DATTA AND M.A S.SRINIVAS, CENGAGE PUBLICATIONS
6) **ADVANCED ENGINEERING MATHEMATICS FOR ENGINEERS** BY PROF.A R K PRASAD., WIELY INDIA
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METALLURGY AND MATERIAL SCIENCE

UNIT – I
Structure of Metals : Bonds in Solids – Metallic bond - crystallization of metals, grain and
grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination
of grain size.
Constitution of Alloys : Necessity of alloying, types of solid solutions, Hume Rotherys rules,
intermediate alloy phases, and electron compounds.

UNIT -II
Equilibrium of Diagrams : Experimental methods of construction of equilibrium diagrams,
Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring
miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction.
Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule,
relationship between equilibrium diagrams and properties of alloys. Study of important
binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu-Sn and Fe-Fe₃C.

UNIT -III
Cast Irons and Steels : Structure and properties of White Cast iron, Malleable Cast iron, grey
cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and
properties of plan carbon steels, Low alloy steels, Hadfield manganese steels, tool and die
steels.

UNIT – IV
Heat treatment of Alloys : Effect of alloying elements on Fe-Fe₃C system, Annealing,
normalizing, Hardening, TTT diagrams, tempering , Hardenability surface - hardening
methods, Age hardening treatment, Cryogenic treatment of alloys.
Non-ferrous Metals and Alloys : Structure and properties of copper and its alloys, Aluminium
and its alloys, Titanium and its alloys.

UNIT – V
Ceramic materials : Crystalline ceramics, glasses, cermaets, abrasive materials,
nonomaterials – definition, properties and applications of the above.
Composite materials : Classification of composites, various methods of component
manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal
ceramic mixtures, metal – matrix composites and C – C composites.

TEXT BOOKS :
1. Introduction to Physical Metallurgy / Sidney H. Avener.
2. Material science & Metallurgy / Kodgire

REFERENCE BOOKS :
2. Materials Science / Vijendra Singh
3. Elements of Material science / V. Rahghavan
4. An introduction to material science / W.g.vinas & HL Mancini
5. Material science & material / C.D.Yesudian & harris Samuel
MECHANICS OF SOLIDS

UNIT-I

UNIT-II
SHEAR FORCE AND BENDING MOMENT: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantiliver, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads – Point of contraflexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT-III
FLEXURAL STRESSES:
Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT-IV
ANALYSIS OF PIN-JOINTED PLANE FRAMES: Determination of Forces in members of plane, pin-joined, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever and simply – supported trusses – by method of joints, method of sections and tension coefficient methods.

DEFLECTION OF BEAMS: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay’s methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. uniformly varying load. Mohr’s theorems – Moment area method – application to simple cases including overhanging beams.

Unit-V

TEXT BOOKS:

REFERENCES:

2. Strength of Materials by S. Tumoshenko
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**THERMODYNAMICS**

**UNIT – I**

**Introduction: Basic Concepts:**


**UNIT II**


**UNIT – III**


**UNIT IV**

Deviations from perfect Gas Model – Vader Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables


**UNIT - V**


**Refrigeration Cycles:**


**TEXT BOOKS** :

1. Engineering Thermodynamics / PK Nag /TMH, III Edition
2. Thermodynamics / C.P.Arora.

REFERENCE BOOKS:
1. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles / TMH
3. Thermodynamics – J.P.Holman / McGrawHill
4. Engineering Thermodynamics – Jones & Dugan
5. An introduction to Thermodynamics / YVC Rao / New Age
7. Thermodynamics – Achutan – PHI.
KINEMATICS OF MACHINES

UNIT – I
Mechanisms: Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematics pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully and incompletely constrained.
Mechanism and Machines – Mobility of Mechanisms: Grubler’s criterion, classification of machines – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage.

UNIT – II
Kinematics: Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method.
Plane motion of body: Instantaneous center of rotation- centrodies and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method.
Kliens construction - Coriolis acceleration - determination of Coriolis component of acceleration
Analysis of Mechanisms: Analysis of slider crank chain for displacement- velocity and acceleration of slider – Acceleration diagram for a given mechanism.

UNIT – III
Straight-line motion mechanisms: Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel – Grasshopper – Watt -Tchebicheff’s and Robert Mechanism - Pantographs
Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman’s steering gear.
Hooke’s Joint: Single and double Hooke’s joint –velocity ratio – application – problems.

UNIT – IV
Cams: Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.
Analysis of motion of followers: Tangent cam with Roller follower – circular arc cam with straight, concave and convex flanks.

UNIT – V
Higher pair: Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding
Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements– Introduction to Helical – Bevel and worm gearing
TEXT BOOKS:
2. Kinematics & Dynamics Of machinery/Norton/TMH

REFERENCE BOOKS:
1. Theory of Machines / Thomas Bevan/CBS
2. Theory of Machines / Sadhu Singh / Pearson.
3. Theory of Machines / Shigley / Oxford
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MACHINE DRAWING PRACTICE LAB

Question Paper Pattern: Question paper has two parts. Part one has five questions out of which answer three (each 10 marks). Part two has one question (assembly with three views) and it is to be answered compulsorily (it carries 50 marks)

Machine Drawing Conventions:

Need for drawing conventions – introduction to ISI conventions

1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
2. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
3. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
4. Title boxes, their size, location and details - common abbreviations and their liberal usage
5. Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and simple parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

6. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
7. Keys, cottered joints and knuckle joint.
8. Rivetted joints for plates
9. Shaft coupling, spigot and socket pipe joint.

Assembly Drawings:

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

11. Steam engine parts – stuffing boxes, cross heads, Eccentrics.
13. Other machine parts - Screws jacks, Petrol engine connecting rod, Plummer block
14. Simple designs of steam stop valve, spring loaded safety valve, feed check valve and air cock.

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

TEXT BOOK:

REFERENCE BOOKS:
JNTUH COLLEGE OF ENGINEERING HYDERABAD


MECHANICS OF SOLIDS AND METALLURGY LAB

LIST OF EXERCISES:

1. Introduction about Chain Survey, Compass Survey and Plane Table Survey
2. Leveling – Longitudinal and Cross sectioning and plotting
3. Trigonometric Leveling using Theodolite (Three Exercises)
4. Heights and distance using Principles of Tacheometric surveying (Two Exercises)
5. Curve setting – Using Theodolite (One Exercises)
6. Total station- Determination of area
7. Traversing and Contouring using total station
8. Curve setting Using Total Station
9. Stake-out using total station

LIST OF EQUIPMENT:

1. Chains and Compass with accessories like tapes, Ranging rods, cross staff, arrows
2. Plane tables with accessories like Alidade, Plumbing fork, trough compasses
3. Level and leveling staves
4. Theodolites and leveling staves.
5. Total station and related software.
FUELS AND LUBRICANTS LAB

1. Determination of Flash and Fire points of Liquid fuels/Lubricants.
2. Carbon residue test: Liquid fuels.
5. Grease penetration test.
6. Viscosity determination by Redwood & Saybolt methods.
UNIT I
Fluid Statics: Dimensions and Units: physical properties of fluids-specific gravity, viscosity, surface tension- vapour pressure and their influence on fluid motion-atmospheric, gauge and vacuum pressure- measurement of pressure- piezometer, U-Tube and Differential Manometers.

UNIT II
Fluid kinematics: stream line, path line and steak line and stream line, classification of flows steady & un steady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three dimensional flow.
Fluid dynamics: Surface & body forces Euler’s & Bernouli’s equations for flow along a stream line, moment equation and its applications on force on pipe bend. Measurement of flow: pitot tube, venture meter and orifice meter, flow nozzle.

UNIT III
Closed conduit flow: Reynold’s experiment-Darcy Weisbach equation-minor losses in pipes-pipes in series and pipes in parallel-total energy line-hydraulic gradient line.
Boundary layer concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivations) boundary layer in transition, separation of boundary layers submerged objects-drag and lift .

UNIT IV
Basics and hydraulic turbine turbo machinery: Hydro dynamic force on jets on stationary and moving plate, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency , flow over radial vanes. Classification of turbines, heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine, and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design-draft tube theory-functions and efficiency.

UNIT V
Performance of hydraulic turbines and pumps: Geometric similarity, unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbines, cavitation, surge tank, water hammer.
Centrifugal pumps: Classification, working, work done-barometric head-losses and efficiencies specific speed-performance characteristic curves, NPSH.
Reciprocating pumps: Working, discharge, slip, indicator diagrams.
TEXT BOOKS:
1. Hydraulics, Fluid mechanics and hydraulic machinery by MODI and SETH
2. Fluid mechanics and hydraulic machines by Rajput

REFERENCES:
1. Fluid mechanics and fluid power engineering by D.S.Kunar, Kotaria and sons.
2. Fluid mechanics and machinery by D. Rama Durgaiah, New age international.
3. Hydraulic machines by Banga and Sharma, Khanna publishers
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THERMAL ENGINEERING - I

UNIT – I
I.C. Engines:

UNIT – II
Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types of SI engines.
Four stages of combustion in CI engines – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel injection– Diesel fuel requirements and fuel rating

UNIT III
Testing and Performance:
Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart
Classification of compressors – Fans, blowers and compressors – positive displacement and dynamic types – reciprocating and rotary types.
Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression

UNIT – IV
Rotary Compressor(Positive displacement type): Roots Blower, vane sealed compressor, Lyslholm compressor – mechanical details and principle of working – efficiency considerations.
Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency-pressure rise calculations – Polytropic efficiency.

UNIT – V
REFRIGERATION : Mechanical Refrigeration and types – units of refrigeration – Air Refrigeration system, details and principle of operation – applications of air refrigeration, Vapour compression refrigeration systems – calculation of COP – effect of superheating and sub cooling, desired properties of refrigerants and common refrigerants- Vapour absorption system – mechanical details – working principle, Use of p-h charts for calculations

Types of air –conditioning systems – Requirements — schematic layout of a typical plant.

TEXT BOOKS:
1. I.C. Engines / V. Ganesan- TMH
2. Thermal Engineering / Rajput / Lakshmi Publications.
3. Thermal Engineering / P.K.Nag

**REFERENCE BOOKS:**
2. Engineering fundamentals of IC Engines – Pulkrabek / Pearson /PHI
3. Thermal Engineering / Rudramoorthy - TMH
4. Thermodynamics & Heat Engines / B. Yadav/ Central Book Depot., Allahabad
5. I.C. Engines / Heywood /McGrawHIll.
UNIT – I
Precession: Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aeroplanes and ships.

UNIT – II
Turning Moment Diagram And Flywheels: Engine Force Analysis – Piston Effort, Crank Effort, etc., Inertia Force in Reciprocating Engine – Graphical Method - Turning moment diagram –fluctuation of energy – flywheels and their design - Inertia of connecting rod-inertia force in reciprocating engines – crank effort and torque diagrams.-.

UNIT – III

UNIT – IV

UNIT – V

TEXT BOOKS:
2. Theory of Machines, R.S.Khurmi

REFERENCE BOOKS:
2. Theory of Machines, Thomas Bevan, CBS Publishers
3. Theory of Machines, R.K.Bansal (Lakshmi publications)
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PRODUCTION TECHNOLOGY

UNIT – I

UNIT – II
Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.

UNIT – III
Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non-destructive testing of welds.

UNIT – IV

UNIT – V

TEXT BOOKS:
1. Manufacturing Technology / P.N. Rao/TMH

REFERENCE BOOKS:
1. Production Technology / R.K. Jain
2. Metal Casting / T.V Ramana Rao / New Age
4. Welding Process / Parmar /
5. Production Technology /Sarma P C /
INSTRUMENTATION AND CONTROL SYSTEMS

UNIT – I

Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

UNIT – II
Measurement of Temperature: Various Principles of measurement-Classification: Expansion Type: Bimetallic Strip- Liquid in glass Thermometer; Electrical Resistance Type: Thermistor, Thermocouple, RTD; Radiation Pyrometry: Optical Pyrometer; Changes in Chemical Phase: Fusible Indicators and Liquid crystals.

Measurement of Pressure: Different principles used- Classification: Manometers, Dead weight pressure gauge. Tester (Piston gauge), Bourdon pressure gauges, Bulk modulus pressure gauges Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges, ionization pressure gauges, Mcleod pressure gauge.

UNIT – III
Flow measurement: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).
Measurement of Speed: Mechanical Tachometers, Electrical tachometers, Non- contact type-Spectroscopy
Measurement of Acceleration and Vibration: Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle- Piezo electric accelerometer.

UNIT – IV

UNIT – V
Elements of Control Systems:
Introduction, Importance – Classification – Open and closed systems- Servomechanisms – Examples with block diagrams – Temperature, speed and position control systems- Transfer functions- First and Second order mechanical systems
TEXT BOOKS:
1. Principles of Industrial Instrumentation & Control Systems, Alavala, Cengage Learning
2. Instrumentation, Measurement & Analysis, B.C.Nakra & K.K.Choudhary, TMH
3. Mechanical Measurements & Controls by D.S. Kumar

REFERENCE BOOKS:
1. Measurement Systems: Applications & design, E.O.Doebelin, TMH
2. Experimental Methods for Engineers / Holman
4. Mechanical Measurements / Sirohi and Radhakrishna / New Age International
FLUID MECHANICS & HYDRAULIC MACHINERY LAB

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli’s equation.
7. Performance test on single stage centrifugal pump
8. Performance test on reciprocating pump
9. Impact of jet on vanes
10. Performance and Specific speed test on Pelton wheel (or Turbo Wheel)
11. Performance and specific speed test on Francis Turbine
12. Performance and specific speed test on Kaplan Turbine
13. Performance test on multi stage pump
14. Suitability test on centrifugal pump
15. Drag and Lift Coefficients of an Aerofoil model.

Any ten of the above experiments are to be covered.
1. Calibration of Pressure Gauges
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotometer for flow measurement.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of McLeod gauge for low pressure.
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PRODUCTION TECHNOLOGY LAB

Metals Casting Lab:

1. Moulding - 2 Exercises
2. Melting & Casting - Demonstration
3. Pattern Marking - 1 Exercise

Welding Lab:

1) Arc Welding:
   a) Effect of polarity on welds strength & Heat affected zone
   b) Effect of current on weld strength and Heat affected zone

2) Spot Welding – Effect of current on weld strength.

3) Gas welding and brazing exercises.

Mechanical Press Working:

1) Blanking & Piercing operation & Study of simple Compound and progressive press tools.
3) Bending and other operations.

Processing of Plastics:

1) Injection Moulding
2) Blow Moulding
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HUMAN VALUES AND PROFESSIONAL ETHICS


Unit IV Professional Rights: professional rights and employee rights communicating risk and public policy – Whistle blowing - collective bargaining. Professionals /engineers as managers, advisors, experts, witnesses and consultants – moral leadership- Regulatory compliances, Monitoring and control- Mini-Cases


Mini-projects

Project 1: The student of this course should invariably attend (or watch on internet/any TV channel/youtube/social media) two speeches of 30 minutes duration each dealing with spiritual discourse and submit a report on the contents of the lecture proceedings.

Project 2: Visit any organization (including shops/ hotels or shopping malls in your region) of your choice and observe how the professionals perform the given job with a focus on professional ethics and human values.

References

1. Aryasri, Human Values and Professional Ethics, Maruthi Publications.
2. S B George, Human Values and Professional Ethics, Vikas Publishing.
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DESIGN OF MACHINE MEMBERS - I

NOTE: Design Data books are not permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

UNIT – I


UNIT – II

UNIT – III

UNIT – IV
KEYS, COTTERS AND KNUCKLE JOINTS: Design of Keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter, jib and cotter joints-Knuckle joints.

UNIT – V
SHAFTS: Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code. Use of internal and external circlips, Gaskets and seals (stationary & rotary)


TEXT BOOKS:
1. Machine design / P. Kannaiah/ Scitech Publishers
2. Machine design/pandya & shah

REFERENCE BOOKS:
1. Machine Design , Soundararajan/ Murthy and Shanmugam
2. Design of Machine Elements/V.M. Faires
4. Mechanical Engineering Design/JE Shigley
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THERMAL ENGINEERING - II

UNIT – I

**Steam Power Plant:** Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating.


UNIT – II

**Steam Nozzles** : Stagnation Properties- Function of nozzle – Applications and Types- Flow through nozzles- Thermodynamic analysis – Assumptions -Velocity of nozzle at exit-Ideal and actual expansion in nozzle- Velocity coefficient- Condition for maximum discharge- Critical pressure ratio- Criteria to decide nozzle shape- Super saturated flow, its effects, Degree of super saturation and Degree of under cooling - Wilson line.

UNIT – III

**Steam Turbines:** Classification – Impulse turbine; Mechanical details – Velocity diagram – Effect of friction – Power developed, Axial thrust, Blade or diagram efficiency – Condition for maximum efficiency. De-Laval Turbine - its features- Methods to reduce rotor speed- Velocity compounding and Pressure compounding- Velocity and Pressure variation along the flow – Combined velocity diagram for a velocity compounded impulse turbine.

**Reaction Turbine:** Mechanical details – Principle of operation, Thermodynamic analysis of a stage, Degree of reaction –Velocity diagram – Parson’s reaction turbine – Condition for maximum efficiency.

UNIT IV

**Steam Condensers:** Requirements of steam condensing plant – Classification of condensers – Working principle of different types – Vacuum efficiency and Condenser efficiency – Air leakage, sources and its affects, Air pump- Cooling water requirement.


UNIT – V


**TEXT BOOKS:**
1. Thermal Engineering / Rajput / Lakshmi Publications
2. Gas Turbines – V.Ganesan /TMH
3. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot
4. Thermal Engineering / Ajoy Kumar / Narosa

**REFERENCE BOOKS:**
3. Gas Turbines / Cohen, Rogers and Saravana Muttoo / Addison Wesley – Longman
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METROLOGY

UNIT – I

UNIT – II
Linear Measurement: Length standard: line and end standard, slip gauges – calibration & manufacture of the slip gauges, Dial indicator, micrometers.
Measurement Of Angles and Tapers: Different methods – Bevel protractor – angle slip gauges – spirit levels – Sine bar – Use of Rollers and Balls to determine the tapers.

UNIT – III
Limit Gauges: Taylor’s principle; Types of gauges - plug, ring, snap, taper, profile and position gauges - Design of GO and NO GO gauges
Optical Measuring Instruments: Tool maker’s microscope and its uses – collimators, optical projector – optical flats and their uses, interferometer.
Flat Surface Measurement: Measurement of flat surfaces – instruments used: straight edges, surface plates, optical flat and auto collimator.

UNIT – IV
Measurement Through Comparators: Comparators: Mechanical, Electrical and Electronic Comparators, Pneumatic comparators and their uses in mass production.
Screw Thread Measurement: Element of measurement – errors in screw threads – measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

UNIT - V
Gear Measurement: Gear measuring instruments, Gear tooth profile measurement, Measurement of diameter, pitch pressure angle and tooth thickness.
Coordinate Measuring Machines: Types of CMM, Role of CMM, and Applications of CMM.

TEXT BOOKS:
1. Engineering Metrology / I C Gupta / Danpath Rai

REFERENCE BOOKS:
1. BIS Standards on Limits & Fits, Surface Finish, Machine Tool Alignment etc.
2. Fundamentals of Dimensional Metrology 4e / Connie Dotson / Thomson

OPEN ELECTIVE-I
GIS & REMOTE SENSING

UNIT – I
Introduction to Photogrammetry: Principle and types of aerial photographs, stereoscopy, Map Vs Mosaic, ground control, Parallax measurements for height, determinations.

Remote Sensing – I: Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units.

UNIT - II
Remote Sensing – II: Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

UNIT – III
Geographic Information System: Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

Types of data representation: Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

UNIT – IV
GIS Spatial Analysis: Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

UNIT – V
Water Resources Applications-I: Land use/Land cover in water resources, Surface water mapping and inventory, Rainfall – Runoff relations and runoff potential indices of watersheds, Flood and Drought impact assessment and monitoring, Watershed management for sustainable development and Watershed characteristics.

Water Resources Applications – II: Reservoir sedimentation, Fluvial Geomorphology, water resources management and monitoring, Ground Water Targeting, Identification of sites for artificial Recharge structures, Drainage Morphometry, Inland water quality survey and management, water depth estimation and bathymetry.

TEXT BOOKS:

REFERENCES:
5. Fundamental of GIS by Mechanical designs John Wiley & Sons.
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OPEN ELECTIVE-I
NON CONVENTIONAL POWER GENERATION

UNIT - I

UNIT - II
Solar-Electric Power generation- Photovoltaic cells- Equivalent circuit- V-I Characteristics- Photovoltaic modules – constructional details- design considerations- Tracking- Maximum power point tracking – algorithms - PV solar system design with energy back up- Solar Thermo electric conversion.

UNIT - III

UNIT - IV

UNIT - V

Text Books

References
2. F.C.Treble, Generating Electricity from Sun.
4. S.P.Sukhatme , Solar Energy Principles and Application - TMH
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OPEN ELECTIVE-I
OPERATIONS RESEARCH

UNIT – I


UNIT – II

UNIT – III
SEQUENCING – Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through ‘m’ machines

REPLACEMENT: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT – IV
INVENTORY: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

UNIT – V

DYNAMIC PROGRAMMING:

TEXT BOOK :
2. Introduction to O.R /Taha PHI

REFERENCE BOOKS :
1. Operations Research: Methods and Problems / Maurice Saseini, Arhur Yaspan and Lawrence Friedman
4. Introduction to O.R/Hillier & Libermann (TMH).
UNIT I:
Block Schematics of Measuring Systems: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag;

UNIT II:
Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators.
Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

UNIT III:
Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT IV:
Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

UNIT V:
Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

TEXT BOOKS:

REFERENCES:
UNIT I:
Object oriented thinking and Java Basics - Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT II:
Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

UNIT III
Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. String handling, Exploring java.util.Differences between multi threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

UNIT IV:
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT V:

TEXT BOOKS:
1. Java the complete reference, 7th edition, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, pearson eduction.
REFERENCES:
2. An Introduction to OOP, third edition, T. Budd, pearson education.
3. Introduction to Java programming, Y. Daniel Liang, pearson education.
9. Maurach’s Beginning Java2 JDK 5, SPD.
Objectives:

- To understand the basic concepts such as Abstract Data Types. Linear and Non Linear Data Structure.
- To understand the notations used to analyze the performance of algorithms.
- To understand the behavior of data structures such as Trees, Graphs and their representation.
- To choose the appropriate data structure for a specified application.
- To analyze performance of algorithms.
- To choose the appropriate data structure and algorithm design method for a specified application.
- To understand how the choice of data structures and algorithms design methods impacts the performance of programs.
- To solve problems using algorithms design methods such as the greedy method, divide and conquer, dynamic programming.

Prerequisites: Data structures, Mathematical foundations of computer science.

Unit I:
C++ Class Overview - Class Definition, Objects, Class Members, Access Control, Class Scope, Constructors and destructors, parameter passing methods, Inline functions, static class members, this pointer, friend functions, dynamic memory allocation and deal location (new and delete), exception handling.

Function Over Loading, Operator Overloading, Generic Programming - Function and class templates, Inheritance basics, base and derived classes, inheritance types, base class access control, runtime polymorphism using virtual functions, abstract classes, streams I/O.

Unit II:
Algorithms, performance analysis - time complexity and space complexity. Review of basic data structures - The list ADT, Stack ADT, Queue ADT, Implementation using template classes in C++.

Dictionaries, linear list representation, skip list representation, operations insertion, deletion and searching.

Unit III:
Trees: Definition, ADT, Trees Implementation Methods. Trees Traversal Methods


Priority Queues – Definition, ADT, Realizing a Priority Queue using Heaps, Definition, insertion, Deletion.

Unit IV:
Algorithms: Pseudo code for expressing algorithms, Performance Analysis - Space complexity, Time complexity, Asymptotic Notation - Big oh notation, Omega notation, Theta notation and Little oh notation, Probabilistic analysis, Amortized analysis.
**Divide and conquer:** General method, applications-Binary search, Quick sort, Merge sort, Stassen’s matrix multiplication.

**Unit V:**
**Dynamic Programming:** General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

**TEXT BOOKS:**

**REFERENCES :**
3. *Data structures using C and C++,* Langsam, Augenstein and Tanenbaum, PHI.
Objectives:

- Provide an introduction to operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection) as fundamental principles by reference to real systems.
- To give exposure to the professional responsibilities that are part of operating system design and development.
- To provide the student with the ability to write system oriented programs on Unix/Linux.

UNIT I:


**UNIX/LINUX Utilities** - Introduction to Unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, text processing utilities and backup utilities.

**Working with Bash shell**: what is a shell, shell responsibilities, pipes and input Redirection, output redirection, here documents, the shell as a programming language, shell meta characters, shell variables, shell commands, the environment, control structures, shell script examples.

UNIT II:

**Process and CPU Scheduling** - Process concepts and scheduling, Operation on processes, Cooperating Processes, Threads, and Interposes Communication Scheduling Criteria, Scheduling Algorithm, Multiple-Processor Scheduling, Real-Time Scheduling.

**System call interface for process management** - fork, exit, wait, waitpid, exec.

**Deadlocks** - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

UNIT – III:


**Interprocess Communication Mechanisms**: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, fifos, message queues, shared memory, semaphores.

UNIT IV

**Memory Management and Virtual Memory** - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging.


UNIT V:

**Unix/LINUX Files**: File structure, directories, files and devices, System calls, library functions, low level file access, usage of open, creat, read, write, close, lseek, stat, ioctl.

**TEXT BOOKS:**
3. Unix the ultimate guide, Sumitabha Das, TMH.

**REFERENCE BOOKS:**
1. Operating System A Design Approach-Crowley,TMH.
3. Operating Systems, Dhamdhere, TMH
4. Unix system programming using C++, T.Chan, PHI.
5. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
7. Unix for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson Education
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OPEN ELECTIVE-I
MATERIALS SCIENCE

UNIT – 1

UNIT – 2

UNIT - 3

UNIT-4:

UNIT-5:

TEXT BOOKS
2. Metallurgy for Engineers – Clark and Varney
3. Elements of Materials Science – V Raghavan

REFERENCE BOOKS
1. Foundations of Materials Science and Engineering – WF Smith
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OPEN ELECTIVE-I

NANOTECHNOLOGY

Unit 1: Background of Nanotechnology
Scientific Revolutions, Nanotechnology and Nanomachines, The Periodic Table, Atomic Structure, Molecules and Phases, Energy, Molecular and Atomic size, Surfaces and Dimensional Space, Top down and Bottom up approach.

Unit 2: Molecular Nanotechnology

Unit 3: Nanopowders and Nanomaterials
What are nanomaterials? Preparation, Plasma arcing, chemical vapor deposition, Sol-gels, Electrodeposition, Ball milling, using natural nanoparticles, Applications of nanomaterials.

Unit 4: Nanoelectronics
Approaches to nanoelectronics, Fabrication of integrated circuits, MEMS, NEMS, Nano circuits, Quantum wire, Quantum well, DNA-directed assembly and application in electronics.

Unit 5: Applications
MEMS, NEMS, Coatings, Optoelectronic Devices, Environmental Applications, Nanomedicine.

Text Books
1. Introduction to Nanoscience and Nanotechnology Gabor L. Hornyak, NanoThread, Inc., Golden, Colorado, USA; H.F. Tibbals, University of Texas Southwestern Medical Center, Dallas, USA; Joydeep Dutta, Asian Institute of Technology, Pathumthani, Thailand; John J. Moore, Colorado School of Mines, Golden, USA
2. Introduction to Nanotechnology by Charles P. Poole Jr and Frank J. Owens Wiley India Pvt Ltd.
3. Introduction to Nanoscience and Nanotechnology, Chatopadhyaya.K.K, and Banerjee A.N,
4. Introduction to nano tech by phani kumar
5. Introduction to Nano Technology by Charles P. Poole Jr and Frank J. Owens. Wiley India Pvt Ltd.
6. Introduction to Nanoscience and Nanotechnology, Chatopadhyaya.K.K, and Banerjee A.N,
NANOTECHNOLOGY Basic Science and EmergingTechnologies by Michael Wilson, Kamali Kannangara Geoff Smith, Michelle Simmons, Burkhard Raguse- CHAPMAN & HALL/CRC PRESS 2002.
OPEN ELECTIVE-I
ENGINEERING MANAGEMENT

Course objectives:
1. to sensitise and orient the future engineers about the challenges in managing engineering enterprises
2. to teach how to provide value through innovations, leadership in technology projects, and the application of emerging technologies through web-based tools

Unit-I
Introduction to Engineering Management - Management Challenges For Engineers – Planning –Organizing –Leading- Controlling-Value Engineering

Unit-II

Unit-III

Unit-IV
Engineers as Managers/Leaders- Ethics In Engineering/Business Management. – Business Process Re-engineering-Ergonomics – Group Technology.

Unit-V
Advanced Manufacturing Technologies and systems -Web-Based Enablers For Engineering And Management- Globalization- Engineering Management In The New Millennium

Text Book:

References:
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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS


TEXT BOOKS:


REFERENCES:


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THERMAL ENGINEERING LAB

Pre-Requisite: Thermodynamics & Thermal Engineering - I

Objective: To understand the working principles of IC Engines, Compressors, Refrigeration and Air Conditioning Systems.

Tables/Codes: Refrigeration Tables, Psychrometric Chart

Syllabus

1. Flash and Fire Points (Open cup & Closed cup method)
2. Viscosity determination by Redwood & Saybolt methods
4. I.C. Engines Valve/Port Timing Diagrams
5. I.C. Engines Performance Test for 4 Stroke SI engines
6. I.C. Engines Performance Test for 2 Stroke SI engines
7. I.C. Engines Morse, Retardation, Motoring Tests
8. I.C. Engines Heat Balance – CI/SI Engines
9. I.C. Engines Economical speed Test on a SI engine
10. I.C. Engines effect of A/F Ratio in a SI engine
11. Performance Test on Variable Compression Ratio Engine
12. IC engine Performance Test on a 4S CI Engine at constant speed
13. Performance Test on Reciprocating Air – Compressor Unit
14. Dis-assembly / Assembly of Engines
15. Study of Boilers

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METROLOGY LAB

1. Measurement of lengths, heights, diameters by vernier calipers, micrometers.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height of the spur gear.
5. Machine tool alignment test on the milling machine.
6. Tool makers microscope and its application
7. Angle and taper measurements by bevel protractor and sine bars.
8. Use of spirit level and optical flats in finding the flatness of surface plate.
9. Thread measurement by 2-wire and 3-wire methods.
10. Surface roughness measurement by Tally Surf.
11. Use of mechanical comparator
12. Use of profile projector
ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

1. Introduction

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use ‘good’ English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students’ fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

Learning Outcomes

- Accomplishment of sound vocabulary and its proper use contextually.
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities

3. Syllabus:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. Activities on Reading Comprehension – General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.

4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ e-mails/assignments etc.

5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. **Minimum Requirement:**
The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- T. V, a digital stereo & Camcorder
- Headphones of High quality


6. **Suggested Software:**
The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner’s Compass, 8th Edition
- DELTA’s key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dreamtech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- The following software from ‘train2success.com’
  - Preparing for being Interviewed
  - Positive Thinking
  - Interviewing Skills
  - Telephone Skills
  - Time Management

7. **Books Recommended:**


**DISTRIBUTION AND WEIGHTAGE OF MARKS:**

**Advanced Communication Skills Lab Practicals:**

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

**Mini Project: As a part of Internal Evaluation**

1. Seminar/ Professional Presentation
2. A Report on the same has to be prepared and presented.

* Teachers may use their discretion to choose topics relevant and suitable to the needs of students.

* Not more than two students to work on each mini project.

* Students may be assessed by their performance both in oral presentation and written report.
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UNIT – I
Fundamentals of CAD, CAM, Automation, design process, Application of computers for design, Benefits of CAD, Computer configuration for CAD applications, Computer peripherals for CAD, Design workstation, Graphic terminal, CAD software: definition of system software and application software, CAD database and structure.

Geometric Modeling: 3-D wire frame modeling, wire frame entities and their definitions, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, definitions of cubic spline, Bezier, and B-spline.

UNIT-II
Surface modeling: Algebraic and geometric form, Parametric space of surface, Blending functions, parametrization of surface patch, Subdividing, Cylindrical surface, Ruled surface, Surface of revolution, Spherical surface, Composite surface, Bezier surface, B-spline surface, Regenerative surface and pathological conditions.

Solid Modelling: Definition of cell composition and spatial occupancy enumeration, Sweep representation, Constructive solid geometry, Boundary representations.

UNIT – III

UNIT – IV
Group Technology: Part families, Parts classification and coding, Production flow analysis, Machine cell design.

Computer aided process planning: Difficulties in traditional process planning, Computer aided process planning: retrieval type and generative type, Machinability data systems.

Computer aided manufacturing resource planning: Material resource planning, inputs to MRP, MRP output records, Benefits of MRP, Enterprise resource planning, Capacity requirements planning.

UNIT – V
Flexible manufacturing system: F.M.S equipment, FMS layouts, Analysis methods for FMS benefits of FMS.
Computer aided quality control: Automated inspection- Off-line, On-line, contact, Non-contact; Coordinate measuring machines, Machine vision.

Computer Integrated Manufacturing: CIM system, Benefits of CIM

TEXT BOOKS:
1. CAD/CAM Principles and Applications, P.N.Rao, TMH
2. CAD/CAM Concepts and Applications, Alavala, PHI
REFERENCE BOOKS:
1. CAD/CAM/Groover M.P., Pearson education
2. CAD / CAM Theory and Practice/ Ibrahim Zeid, TMH
3. CAD / CAM / CIM, Radhakrishnan and Subramanian, New Age
HEAT TRANSFER

UNIT – I
Introduction: Modes and mechanisms of heat transfer – Basic laws of heat transfer – General discussion about applications of heat transfer.
Conduction Heat Transfer: Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates – simplification and forms of the field equation – steady, unsteady and periodic heat transfer – Initial and boundary conditions
One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow cylinders and spheres- Composite systems– overall heat transfer coefficient – Electrical analogy – Critical radius of insulation

UNIT – II
One Dimensional Steady State Conduction Heat Transfer: Variable Thermal conductivity – systems with heat sources or Heat generation-Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature
One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers – Infinite bodies- Chart solutions of transient conduction systems- Concept of Semi infinite body.

UNIT – III

UNIT – IV
Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate - Use of empirical relations for Vertical plates and pipes.

UNIT V
Heat Transfer with Phase Change:
Boiling: – Pool boiling – Regimes – Calculations on Nucleate boiling, Critical Heat flux and Film boiling
Condensation: Film wise and drop wise condensation –Nusselt’s Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

TEXT BOOK:

REFERENCE BOOKS:
1. Heat Transfer – A Practical Approach – Yunus Cengel, Boles / TMH
2. Heat Transfer / HOLMAN / TMH
5. Essential Heat Transfer - Christopher A Long / Pearson Education
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OPEN ELECTIVE-II
ESTIMATION, QUANTITY SURVEY & VALUATION

UNIT – I

UNIT – II
Detailed Estimates of Buildings - Reinforcement bar bending and bar requirement schedules

UNIT – III
Earthwork for roads and canals.

UNIT – IV
Rate Analysis – Working out data for various items of work over head and contigent charges.

UNIT-V

NOTE: NUMBER OF EXERCISES PROPOSED:
1. Three in flat Roof & one in Sloped Roof
2. Exercises on Data – three Nos.

Text Books
2. Estimating and Costing by G.S. Birdie

Reference books:
2. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
3. Estimation, Costing and Specifications by M. Chakraborti; Laxmi publications.
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OPEN ELECTIVE-II
ENERGY STORAGE SYSTEMS

Unit-1 Electrical Energy Storage Technologies
Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable.

Unit-2 Needs for Electrical Energy Storage
Emerging needs for EES, More renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

Unit-3 Features of Energy Storage Systems
Classification of EES systems, Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG).

Unit-4 Types of Electrical Energy Storage systems
Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES), Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

Unit-5 Applications
Present status of applications, Utility use (conventional power generation, grid operation & service), Consumer use (uninterruptable power supply for large consumers), New trends in applications, Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems, Internal configuration of battery storage systems, External connection of EES systems, Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA—aggregation of many dispersed batteries.

TEXT BOOK:

REFERENCE BOOKS:
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OPEN ELECTIVE-II
MECHATRONICS

UNIT – I
INTRODUCTION: Definition – Trends - Control Methods: Standalone , PC Based ( Real Time Operating Systems, Graphical User Interface – Simulation ) - Applications: identification of sensors and actuators in Washing machine, Automatic Camera, Engine Management, SPM, Robot, CNC, FMS, CIM.

UNIT – II
PRECISION MECHANICAL SYSTEMS :
Modern CNC Machines – Design aspects in machine structures, guideways, feed drives, spindle and spindle bearings, measuring systems, control software and operator interface, gauging and tool monitoring.
Note: (text book: Mechatronics HMT – chapter 5)

ELECTRONIC INTERFACE SUBSYSTEMS :
TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids , motors Isolation schemes- opto coupling, buffer IC’s - Protection schemes – circuit breakers , over current sensing , resetable fuses , thermal dissipation - Power Supply - Bipolar transistors / mosfets

UNIT – III
ELECTROMECHANICAL DRIVES :
Relays and Solenoids - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors - 4-quadrant servo drives , PWM’s - Pulse Width Modulation – Variable Frequency Drives, Vector Drives - Drive System load calculation.

MICROCONTROLLERS OVERVIEW :

UNIT – IV
PROGRAMMABLE LOGIC CONTROLLERS :

UNIT – V
PROGRAMMABLE MOTION CONTROLLERS :

TEXT BOOKS :
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

REFERENCE:
2. Michel B. Histand and David G. Alciatore,”
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OPEN ELECTIVE-II
PRINCIPLES OF COMMUNICATION SYSTEMS

Unit 1:
Introduction: Communication Systems and types, modulation and multiplexing, Electromagnetic spectrum, Gain, Attenuation and decibels.

Unit 2:

Unit 3:
Telecommunication Systems: Telephones Telephone system, Paging systems, Telephony. Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

Unit 4:

Unit 5:

Text Books:

Reference Books:
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OPEN ELECTIVE-II
E-COMMERCE

UNIT-I
Electronic Commerce-Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

UNIT-II
Consumer Oriented Electronic commerce - Mercantile Process models, Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

UNIT-III
Inter Organizational Commerce - EDI, EDI Implementation, Value added networks, Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT-IV

UNIT-V
Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering, Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processings, Desktop video conferencing.

TEXT BOOKS:

REFERENCE BOOKS:
1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
Objectives:
- To make students understand about fundamentals of Graphics to enable them to design animated scenes for virtual object creations.
- To make the student present the content graphically.

Outcomes:
- Students can animate scenes entertainment.
- Will be able work in computer aided design for content presentation.
- Better analogy data with pictorial representation.

UNIT-I:
Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and workstations and input devices
Output primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms

UNIT-II:
2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems
2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to viewport coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland–Hodgeman polygon clipping algorithm

UNIT-III:
3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.
3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations. 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT-IV:
Visible surface detection methods: Classification, back-face detection, depth-buffer, scanline, depth sorting, BSP-tree methods, area sub-division and octree methods

UNIT-V:
Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

Text Books:

References:
6. Computer Graphics, Steven Harrington, TMH
OPEN ELECTIVE-II
DATABASE MANAGEMENT SYSTEMS

Objectives:
- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- To understand the relational database design principles.
- To become familiar with the basic issues of transaction processing and concurrency control.
- To become familiar with database storage structures and access techniques.

UNIT I:
Data base System Applications: data base System VS file System, View of Data, Data Abstraction, Instances and Schemas, data Models , the ER Model, Relational Model, Other Models, Database Languages, DDL, DML, database Access for applications Programs ,data base Users and Administrator ,Transaction Management, data base System Structure, Storage Manager, the Query Processor. History of Data base Systems. Data base design and ER diagrams, Beyond ER Design Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model ,Concept Design with the ER Model, Conceptual Design for Large enterprises.

UNIT II:
Introduction to the Relational Model: Integrity Constraint Over relations ,Enforcing Integrity constraints , Querying relational data , Logical data base Design ,Introduction to Views, Destroying /altering Tables and Views. Form of Basic SQL Query, Examples of Basic SQL Queries, Introduction to Nested Queries ,Correlated Nested Queries Set, Comparison Operators, Aggregative Operators, NULL values ,Comparison using Null values ,Logical connectivity’s, AND, OR and NOT, Impact on SQL Constructs Outer Joins, Disallowing NULL values ,Complex Integrity Constraints in SQL Triggers and Active Data bases, Oracle, SQL Server,DB2.

UNIT III:
Relational Algebra :Selection and projection set operations, renaming Joins ,Division, Examples of Algebra overviews, Relational calculus, Tuple relational Calculus, Domain relational calculus ,Expressive Power of Algebra and calculus. 
Schema refinement: Problems Caused by redundancy, Decompositions, Problem related to decomposition, reasoning about FDS,FIRST, SECOND, THIRD Normal forms ,BCNF, Lossless join Decomposition ,Dependency preserving Decomposition, Schema refinement in Data base Design ,Multi valued Dependencies , FORTH Normal Form, FIFTH Normal Form.

UNIT IV:
Recovery and Atomicity ,Log–Based Recovery ,Recovery with Concurrent Transactions, Buffer Management, Failure with loss of nonvolatile storage, Advance Recovery systems, Remote Backup systems.

UNIT V:

**Text Books:**

**References:**
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
3. Introduction to Database Systems, C.J.Date Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V.Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
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OPEN ELECTIVE-II
NANOMATERIALS

Unit – I
Introduction
What is Nano – Why Nano – Properties at Nano Scales, Advantages & Disadvantages, Applications in comparison with bulk materials (Nanostructure, nanowires, nanotubes, nanocomposites)

Nano Particles
Introduction – Synthesis procedures – wet chemical approach & physical vapor synthesis approach – size effect & shape change and their properties – examples of systems involved – characterization techniques – properties & their applications

Unit – II
Nano Wires

Nanotubes

Unit – III
Nano Composites

Unit – IV
Micro/Nano Fabrication Techniques
Introduction, Basic fabrication techniques (lithography, thin film deposition and doping) MEMS fabrication techniques, Nano fabrication techniques (E-Beam nano-imprint fabrication, Epitaxy and strain engineering. Scanned probe techniques)

Unit – V
Materials of Nano Technology

Nano Biomaterials
Introduction, Biocompatibility; anti bacterial activity – principles involved – Applications.

TEXT / Reference BOOKS
2. Nano Essentials: T. Pradeep, TMH
3. Springer Handbook of Nanotechnology
4. The Guest for new materials Author S. T. Lakshmi Kumar, Published by Vigyan Prasar.
5. "Nano – The Essentials" by C. Pradeep (IICue Professor), McGraw Hill
Unit-I
Introduction to Intellectual property law Basics-types of Intellectual property-Agencies responsible for intellectual property registration, internal organisations, and treaties the increasing importance of intellectual property rights. Foundation of trade mark law purpose types and function of trade mark A acquisition of trademarks rights. Selecting and evaluating the application drawing mark a mark .preparing the application drawing of marks.

Unit-II
Interparty proceeding, infringement, and dilution, inter parties proceedings infringement of trademarks dilution of trademarks related trade mark claims. New development in trademark law the internet protecting a domain names hyper linking and the first amendment other cyberspace trade mark issues. Applications in the United States based on foreign applications and registration.

Unit-III
Foundations of copyright law common law right and right under the 1976 copyright Act the united states copyright office-the subject matter of copyright, originality of material fixation of material work of authorship exclusion from copyright protection case study and activity. The right afforded by copyright law right of reproduction right to prepare derivative works copyright ownership, transfer and duration.

Unit-IV
Introduction foundations of patent law rights under federal law United States patent and trademark office design patents plant patents double patenting the orphan drug Act. Patent ownership and transfer sole and joint inventor’s disputes over inventor ship. New developments and international patent law

Unit-V
The law of trade secrets unfair competition determination of trade secret status liability for misappropriation of trade secrets employer-employee relationships protection for submissions defences to trade secret misappropriation remedies for misappropriation trade secret litigation trade secret protection programs. Intellectual property audits and due diligence reviews.

TEXT BOOKS:

REFERENCES:
OPEN ELECTIVE-II
ENTREPRENEURSHIP

Aim: The aim of this subject is to inspire students to become entrepreneurs so that they will emerge as job providers rather than job seekers.

Learning Outcome: By the end of this course the students should be able to understand the mindset of the entrepreneurs, identify ventures for launching, develop an idea on the legal framework and also understand strategic perspectives in entrepreneurship.

   Case 1: Ready, Aim, Fire Fire (B. Janakiram, M. Rizwana, page 212),
   Case 2: Henry Ford, (B. Janakiram, M. Rizwana, page 214)
   Case 3: From candle seller to CEO (Arya Kumar P.No. 48)

   Case: Globalizing Local Talent, (B. Janakiram, M. Rizwana, page 228).

   Case 1: Water, Water everywhere: but not a drop to drink, (Richard Blundel , Page 48).
   Case 3: Pets.com (Arya Kumar P.No. 88)
   Case 4: creativity in start-ups (Arya Kumar P.No. 166)
   Case 5: Opportunity – Earthmoving Industry (Arya Kumar P.No. 211)

   Case 1: Victoria, Tomlinson; Network. (Richard Blundel, Page 99).
   Case 2: Tim Lockett, Knowing your Customers & Suppliers (Richard Blundel Page128).
   Case 3: Google (Arya Kumar P.No. 248)
   Case 4: Tata Motors – Nano (Arya Kumar P.No. 279)

5. Strategic perspectives in entrepreneurship- Strategic planning-Strategic actions- strategic positioning-Business stabilization- Building the adaptive firms-Understanding the growth stage- Unique managerial concern of growing ventures.
   Case 1: To Lease or Not: A Cash flow Question (David H.Holt, Page 452).
   Case 2: Public Sector - address seed capital (David H.Holt, Page 453).

READING
Text Book :
Cases:

Journal:
1. The Journal of Entrepreneurship, Entrepreneurship Development Institute of India, Ahmedabad,

References:
UNIT – I
Introduction: Components of four wheeler automobile – chassis and body – power unit –
power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile
engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil
filters, oil pumps – crank case ventilation – engine service, reboring, decarburization, Nitriding of crank shaft..

Emission from Automobiles – Pollution standards, National and international – Pollution
Control – Techniques – Noise Pollution & control.

UNIT – II
Fuel System: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pumps –
C.I. Engines: Requirements of diesel injection systems, types of injection systems, fuel
pump, nozzle, Alternative fuels for Automobiles-injection, Classification, Properties, Hybrid
vehicles injection timing, testing of fuel, pumps.

UNIT – III
Cooling System: Cooling Requirements, Air Cooling, Liquid Cooling and Forced
Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating
cooling – pressure sealed cooling – antifreeze solutions.
Ignition System: Function of an ignition system, battery ignition system, constructional
features of storage battery, auto transformer, contact breaker points, condenser and spark plug
– Magneto coil ignition system, electronic ignition system using contact breaker, electronic
ignition using contact triggers – spark advance and retard mechanism.

UNIT – IV
Electrical System: Charging circuit, generator, current – voltage regulator – starting system,
bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil
pressure gauge, engine temperature indicator etc.

Transmission System: Clutches, principle, types, cone clutch, single plate clutch, multi
plate clutch, magnetic and centrifugal clutches, fluid fly wheel – Gear boxes, types, sliding
mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box , over drive torque
converter.
Propeller shaft – Hoatch – Kiss drive, Torque tube drive universal joint, differential rear axles
– types – wheels and tyres.

UNIT – V
Steering System: Steering geometry – camber, castor, king pin rake, combined angle toe in,
center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis
steering mechanism, steering gears – types, steering linkages.
Suspension System: Objects of suspension systems – rigid axle suspension system, torsion
bar, shock absorber, Independent suspension system.
Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel
cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.
TEXT BOOKS:

REFERENCE BOOKS:
1. A System approach to Automotive Technology by Jack Erjavec, YesDee publishing pvt Ltd.
2. Automobile Engineering / William Crouse
3. Automotive Mechanics / Heitner
NON-CONVENTIONAL SOURCES OF ENERGY
Departmental Electives-I

UNIT – I
PRINCIPLES OF SOLAR RADIATION: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power - Physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT - II
SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications - solar heating/cooling techniques, solar distillation and drying, Photovoltaic energy conversion.

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT - III

UNIT – IV
GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy, potential in India.

UNIT –V
DIRECT ENERGY CONVERSION: Need for DEC, Carnot cycle, limitations, Principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principle, faraday’s laws, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:
1. Renewable Energy Resources / Tiwari and Ghosal / Narosa
2. Non- conventional Energy Sources / G.D. Rai

REFERENCE BOOKS:
1. Renewable Energy Sources / Twidell & Weir
2. Solar Energy / Sukhame
5. Non-Conventional Energy / Ashok V Desai / Wiley Eastern
7. Renewable Energy Technologies / Ramesh & Kumar / Narosa
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TRIBOLOGY
Departmental Electives-I

UNIT – I
Study of various parameters: Viscosity, flow of fluids, viscosity and its variation, absolute and
kinematic viscosity, temperature variation, viscosity index, determination of viscosity,
different viscometers used.
Hydrostatic lubrication: Hydrostatic step bearing, application to pivoted pad thrust bearing
and other applications, hydrostatic lifts, hydrostatic squeeze films and its application to
journal bearing.

UNIT – II
Hydrodynamic theory of lubrication: Various theories of lubrication, petroffs equation,
Reynold’s equation in two dimensions -Effects of side leakage - Reynolds equation in three
dimensions, Friction in sliding bearing, hydro-dynamic theory applied to journal bearing,
minimum oil film thickness, oil whip and whirl anti-friction bearing.

UNIT – III
Friction and power losses in journal bearings : Calibration of friction loss, friction in
concentric bearings, bearing modulus, Sommer-field number, heat balance, practical
consideration of journal bearing design considerations.

UNIT – IV
Air lubricated bearing: Advantages and disadvantages, application to Hydrodynamic journal
bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings. Hydrostatic bearing
Analysis including compressibility effect. Study of current concepts of boundary friction and dry friction.

UNIT-V
Types of bearing oil pads: Hydrostatic bearing wick oiled bearings, oil rings, pressure feed
bearing, partial bearings -externally pressurized bearings.
Bearing materials : General requirements of bearing materials, types of bearing materials.

TEXT BOOK :
1. Fundamentals of Tribology, Basu, SenGupta and Ahuja/PHI
2. Tribology in Industry : Sushil Kumar Srivatsava, S. Chand &Co.

REFERENCE :
1. Tribology – B.C. Majumdar
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NEURAL NETWORKS & FUZZY LOGIC
Departmental Electives-I

Unit – I
Introduction to Neural Networks

Unit –II
Single Layer Feed Forward Neural Networks

Multilayer Feed forward Neural Networks
Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

Unit III
Associative Memories

Unit IV
Classical & Fuzzy Sets
Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

Fuzzy Logic System Components
Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

Unit V
Applications: Neural network applications: Process identification, control, fault diagnosis and load forecasting.
Fuzzy logic applications: Fuzzy logic control and Fuzzy classification.
Mechanical Applications: Washing machines, Chemical Plants Refrigeration systems, Weather Control Systems.
TEXT BOOK:
1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.

REFERENCE BOOKS:
2. Fuzzy Logic and Neural Networks, Alavala, New Age International
4. Neural Networks – Simon Hykins , Pearson Education
JNTUH COLLEGE OF ENGINEERING HYDERABAD


PLANT LAYOUT AND MATERIAL HANDLING
Departmental Electives-I

UNIT-I
Introduction – classification of layout, advantages and limitations of different layouts, layout design procedures, overview of plant layout.

UNIT-II

UNIT- III
Heuristics for plant layout- ALDEP, CORELAP, CRAFT
Group layout, fixed position layout- quadratic assignment model, branch and bound method.

UNIT IV
Introduction , material handling systems, material handling principles, classification of material handling equipment, relationship of material handling to plant layout.
Basic material handling systems: selection , material handling methods- path, equipment, function oriented systems,

UNIT V
Methods to minimize cost of material handling – maintenance of material handling equipments, safety in handling.
Ergonomics of material handling equipment. Design , miscellaneous equipments.

TEXT BOOK:
1. Aspects of material Handling/ Dr. KC Arora & Shinde, Lakshmi Publications.
2. Operations Management/ PB Mahapatra /PHI

REFERENCE BOOKS:
1. Faciliy Layout & Location an analytical approach/ RL Francis /LF Mc Linnis Jr, White / PHI
2. Production and Operations Management/ R Panneerselvam/ PHI
3. Introduction to Material handling/ Ray, Siddhartha/ New Age
JNTUH COLLEGE OF ENGINEERING HYDERABAD


POWER PLANT ENGINEERING
Departmental Electives-II

UNIT – I
Introduction to the Sources of Energy – Resources and Development of Power in India.

**Steam Power Plant:** Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

**Combustion Process:** Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

UNIT – II
Internal Combustion Engine Plant:

**Diesel Power Plant:** Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.


**Direct Energy Conversion:** Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

UNIT – III

**Hydro Electric Power Plant:** Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways.

**Hydro Projects And Plant:** Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.


UNIT – IV

**Nuclear Power Station:** Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation.

**Types of Reactors:** Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

UNIT – V

**Power Plant Economics And Environmental Considerations:** Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

**TEXT BOOK :**

**REFERENCES :**
1. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications
2. Power plant Engineering/ Ramalingam/ Scietech Publishers

ADVANCED MECHANICS OF COMPOSITE MATERIALS
Departmental Electives-II

UNIT-I
Introduction to Composite Materials: Introduction, Classification Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon–Carbon Composites, Fiber-Reinforced Composites and nature-made composites, and applications.

UNIT-II

UNIT-III

UNIT-IV

UNIT-V

Text Books:

References:
UNIT – I
**Introduction**: Definition – Objectives of Production Planning and Control – Functions of production planning and control - Types of production systems - Organization of production planning and control department.

**Forecasting** – Definition- uses of forecast- factors affecting the forecast- types of forecasting- their uses - general principle of forecasting. Forecasting techniques- quantitative and qualitative techniques. Measures of forecasting errors.

UNIT – II
**Inventory management** – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – Basic EOQ model- Inventory control systems –continuous review systems and periodic review systems, MRP I, MRP II, ERP, JIT Systems - Basic Treatment only.

**Aggregate planning** – Definition – aggregate-planning strategies – aggregate planning methods – transportation model.

UNIT – III
Routing – Definition – Routing procedure – Factors affecting routing procedure, Route Sheet.

UNIT – IV

UNIT – V
**Dispatching**: Definition – activities of dispatcher – dispatching procedures – various forms used in dispatching.

**Follow up**: definition – types of follow up – expediting – definition – expediting procedures- Applications of computers in planning and control.

**TEXT BOOKS:**
1. Production Planning and Control – M.Mahajan- Dhanpati rai & Co
2. Production Planning and Control- Jain & Jain – Khanna publications

**REFERENCE BOOKS**:
1. Production Planning and Control- Text & cases/ SK Mukhopadhyaya /PHI.
3. Operations Management by Chase/PHI
4. Management Science – A R Aryasri- 4e –TMH
5. Operations management – Heizer- Pearson
JNTUH COLLEGE OF ENGINEERING HYDERABAD


MODERN CONTROL THEORY
Departmental Electives-II

Unit-I

Unit-II
State Variable Analysis, Controllability and Observability:
Linear continuous time models for physical systems, Existence and uniqueness of solutions to continuous, Time state equations, solutions of linear time invariant continuous, time state equation, state transition matrix and its properties.
General concept of controllability, General concept of Observability, Controllability tests for continuous, Time Invariant systems, Controllability and Observability of state Model in Jordan Canonical form, Controllability and Observability canonical forms of state model.

Unit-III
Non Linear Systems:
Introduction to phase, plan analysis, Method of Isoclines for constructing Trajectories, Singular points, Phase, plane analysis of nonlinear control systems.

Unit-IV
Stability analysis of Non Linear Systems:
Stability in the sense of Lyapunov, Lyapunov’s stability and Lyapunov’s instability theorems – stability Analysis of the Linear continuous time invariant systems by Lyapunov second method, Generation of Lyapunov Functions, Variable Gradient Method – Krasooviski’s method. Static feedback controllers and Observers, State feedback controller design through pole assignment, state observers: Full order and Reduced order.

Unit-V
Optimal Control:
Introduction to optimal control, Formulation of optimal control Problems, calculus of variations, fundamental concepts, functionals, variations of functionals, fundamental theorem of Calculus of variations – boundary conditions- constrained minimization- formulation using Hamiltonian method- Linear Quadratic regulator.

Text Books
1. Modern control system theory by M. Gopal- New Age International- 1984

References:
1. Optimal control by Kircks
JNTUH COLLEGE OF ENGINEERING HYDERABAD

FLUID POWER SYSTEMS
Departmental Electives-II

UNIT I INTRODUCTION
Need for Automation, comparison with other power systems-ISO symbols for fluid power elements-Economic consideration of fluid power systems-Oil hydraulics, pneumatic-introduction and selection criterion.

UNIT II HYDRAULIC POWER GENERATION, CONTROL AND REGULATING ELEMENTS
Basic elements in a fluid power system-Hydraulic pumps, Gear, Vane, piston-selection and specification, drive characteristics Hydraulic actuators-Linear and Rotary, selection specification and characteristics, cushioning.

UNIT III PNEUMATICS AND ELECTRO PNEUMATICS
Generation and control of compressed air-Elements in pneumatic circuits, Fluidic devices and its applications Flip-Flop, SRT Flip flop-Use of electrical switches, relays, timers in fluid power circuits-Electro pneumatics.

UNIT IV CIRCUIT DESIGN
Design and methodology-sequential circuits, cascade, Karnaugh-Veitch map, step counter methods-Compound and combination circuit design. Typical Industrial and hydraulic circuits-Synchronising and accumulator circuits-Circuits for machine tools-Aerospace application-Design and selection criteria. Electro pneumatic circuit design, Ladder diagram.

UNIT V COMPUTER CONTROL & MAINTENANCE OF FLUID POWER CIRCUITS
Fuzzy logic in fluid power circuits-PLC in fluid powers-PLC ladder diagram. Installation-Fault diagnosis in fluid power circuits.

REFERENCES:
JNTUH COLLEGE OF ENGINEERING HYDERABAD


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KINEMATICS AND DYNAMICS LABORATORY
(A Minimum of 10 experiments are to be conducted)

Experiments:
1. Determination of damped natural frequency of vibration of the vibrating system with different viscous oils.
2. Determination of steady state amplitude of a forced vibratory system.
4. Determination of the magnitude and orientation of the balancing mass in dynamic balancing.
5. Field balancing of the thin rotors using vibration pickups.
6. Determination of the magnitude of gyroscopic couple, angular velocity of precession and representation of vectors.
7. Determination of natural frequency of given structure using FFT analyzer.
8. Diagnosis of a machine using FFT analyzer.
10. Inverse Kinematic analysis of a robot.
11. Trajectory planning of a robot in joint space scheme.
### HEAT TRANSFER LAB

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
JNTUH COLLEGE OF ENGINEERING HYDERABAD


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COMPUTER AIDED ENGINEERING LAB

Perform any 12 Experiments.

1. Drafting: Development of part drawings for various components in the form of orthographic and isometric. Representation of dimensioning and tolerances.
3. Determination of deflections, principal and Von-mises stresses in plane stress, plane strain and Axi-symmetric components.
4. Determination of stresses in 3D and shell structures (at least one example in each case)
5. Study state heat transfer analysis of plane and axi-symmetric components.
6. Truss analysis using FEA software
7. Beam analysis using FEA software
8. Frame analysis using FEA software
9. Buckling analysis using FEA software
10. Harmonic analysis using FEA software
11. Fracture analysis using FEA software
12. Analysis of laminated composite using FEA software
13. Coupled field analysis using FEA software
14. Model analysis
15. Transient dynamic analysis
17. Steady-state and uniform flow analysis.
UNIT 1 : Understanding Disaster
Concept of Disaster
Different approaches
Concept of Risk
Levels of Disasters
Disaster Phenomena and Events (Global, national and regional)

Hazards and Vulnerability
Natural and man-made hazards; response time, frequency and forewarning levels of different hazards
Characteristics and damage potential or natural hazards; hazard assessment
Dimensions of vulnerability factors; vulnerability assessment
Vulnerability and disaster risk
Vulnerabilities to flood and earthquake hazards

UNIT 2 : Disaster Management Mechanism
Concepts of risk management and crisis managements
Disaster Management Cycle
Response and Recovery
Development, Prevention, Mitigation and Preparedness
Planning for Relief

UNIT 3: Capacity Building
Capacity Building: Concept
Structural and Nonstructural Measures
Capacity Assessment; Strengthening Capacity for Reducing Risk
Counter-Disaster Resources and their utility in Disaster Management
Legislative Support at the state and national levels

UNIT 4: Coping with Disaster
Coping Strategies; alternative adjustment processes
Changing Concepts of disaster management
Industrial Safety Plan; Safety norms and survival kits
Mass media and disaster management

UNIT 5: Planning for disaster management
Strategies for disaster management planning
Steps for formulating a disaster risk reduction plan
Disaster management Act and Policy in India
Organizational structure for disaster management in India
Preparation of state and district disaster management plans

Text Books
References
UNIT I:
Fourier Transform:
Fourier transform and relation between Fourier series and Fourier transform (F.T), Properties of Fourier Transform, Conditions for existence of F.T, Linear system, Impulse response, Response of a linear system, Linear time invariant (LTI) system, Transfer function of a LTI system, Filter characteristics of linear systems, Distortionless transmission through a system, Physical Realizability of LTI systems

Z-Transform (Z.T):

UNIT II:
Discrete Time Fourier Transform
Discrete Time (DT) signals and sequences, Properties of DT LTI system- Linearity, Time invariance, Stability, Causality, Memoryless, Linear Constant Coefficient Difference Equations and its solution, Concept of Discrete Time Fourier Transform (DTFT), Frequency domain representation of discrete time signals and systems, Properties of DTFT, Problems

UNIT III:
Discrete Fourier representation
Discrete Fourier Series (DFS): DFS representation of periodic sequences, Properties, Problems

UNIT IV:
IIR Digital Filters:
Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from Analog filters- Impulse Invariance and Bilinear Transformation techniques, Design Examples, Realization of IIR filters in Direct, Canonic forms

UNIT V:
FIR Digital Filters:
Characteristics of FIR Digital Filters, Frequency response, Design of FIR Digital Filters - Fourier method, Window Techniques (using rectangular, Hanning and Hamming windows) Frequency Sampling technique, Comparison of IIR & FIR filters, Realization of FIR filters in Direct, Canonic forms

TEXT BOOKS:
REFERENCES:

UNIT I:

UNIT II:
MOTION ANALYSIS AND CONTROL: Manipulator Kinematics, position representation, Homogeneous transformation, D-H Notation, D-H Transformation Matrix, Forward & Inverse transformations, problems on planar & spatial manipulators, Differential Kinematics, Jacobian Formulation, Problems, manipulator path control: Slew, Joint Interpolated & Straight line motions, trajectory planning: Joint space scheme, Cartesian space scheme, Cubic Polynomial fit without and with via point, blending.

UNIT III:
ROBOT DYNAMICS: Lagrange – Euler & Newton Euler formulations, problems on two link planar manipulators, configuration of robot controller.
END EFFECTORS: Grippers –types, operation, mechanism, force analysis, tools as end effectors consideration in gripper selection and design.
MACHINE VISION: Functions, Sensing and Digitizing-imaging, Devices, Lighting techniques, Analog to digital single conversion, Image storage, Image Processing and Analysis-image data reduction, Segmentation feature extraction. Object recognition, training the vision system, Robotics application.

UNIT-IV:
ROBOT PROGRAMMING: Lead through programming, Robot programming as a path in space, Motion interpolation, WAIT, SIGNAL AND DELAY commands, Branching capabilities and Limitations.
ROBOT LANGUAGES: Textual robot languages, Generation, Robot language structures, Elements and functions.

UNIT – V:
ROBOT CELL DESIGN AND CONTROL: Robot Cell layouts-Robot centered cell, In-line robot cell, Considerations in work cell design, Work cell control, Inter locks, Error etection, Work cell controller.
ROBOT APPLICATIONS: Material transfer, Machine loading/unloading, Processing operations, Assembly and Inspection, Future Applications.

TEXT BOOKS:
1. Introduction to Robotics Mechatronics & Control/ John J. Craig/Pearson
2. Industrial robotics/ Mikell P. Groover/Mc Graw Hill.
REFERENCES:
2. Robot Analysis/Lung Wen T sai/ John Wiley & Sons.
5. Robotics by saha/TMG
6. Robotic Engineering/Richard D. Klafter, Thomas A. Chemielewski/PHI
7. Modelling and Control of Robot Manipulators/ L. Sciavicco & B. Sicliano/ Springer
FRACTURE MECHANICS
(PGE-I)

Prerequisite: none
Course Outcomes: At the end of the course the students will be able to
- Predict material failure for any combination of applied stresses.
- Estimate failure conditions of a structure
- Determine the stress intensity factor for simple components of simple geometry
- Predict the likelihood of failure of a structure containing a defect

UNIT I:

UNIT II:

UNIT III:
PHYSICAL ASPECTS OF FATIGUE:
Phase in fatigue life - Crack initiation – Crack growth - Final fracture - Dislocation – Fatigue fracture surfaces. Safe Life and Fail safe design philosophies Importance of Fracture Mechanics in Aerospace structure – Applications to composite materials and structures.

UNIT IV:
STATICAL ASPECTS OF FATIGUE BEHAVIOUR:
Low cycle and high cycle fatigue - Coffin- Manson’s Relation –Transition Life – Cyclic strain hardening and softening – Analysis of load histories – Cycle counting techniques – Cumulative damage – Miner’s theory, other theories.

UNIT V:

Text Books:

References:
Prerequisite: none

Course Outcomes: At the end of the course the students will be able to

- Know the working principle of strain gauges and do the model analysis using different theorems.
- Know the concepts of photo elasticity and its applications.
- Use the various Non-destructive testing methods.

UNIT-I

UNIT-II
Model Analysis - Structural similitude – Use of models – Structural and dimensional analysis – Buckingham Pi Theorem – Muller Breslau’s principle for indirect model analysis – Use of Begg’s and Eney’s deformeters – Moment indicators – Design of models for direct and indirect analysis.

Unit-III

Unit-IV

Unit-V

Text books :
1. Experimental stress analysis by Dally and Riley, Mc Graw-Hill

References:
1. Experimental stress analysis by Sadhu singh, Danapathi rai publications
ADVANCED MECHANICS OF SOLIDS  
(PGE-I)

Prerequisite: Applied Mechanics, mechanics of solids

Course outcomes: After completing this course, the student should be able to
- Determined the point of location of applied load to avoid twisting in thin sections used in aerospace applications.
- Understand the concept of distinguish between neutral and centroidal axes in curved beams.
- Understanding the analogy models developed for analyzing the non circular bars subjected to torsion, and also analyzing the stresses developed between rolling bodies and stress in three dimensional bodies.

Unit –I:
Shear center: Bending axis and shear center-shear center for axi-symmetric and unsymmetrical sections.
Unsymmetrical bending: Bending stresses in Beams subjected to Nonsymmetrical bending, Deflection of straight beams due to nonsymmetrical bending.

Unit –II:

Unit –III:
Torsion: Linear elastic solution Prandtl elastic membrane (Soap-Film) Analogy; Narrow rectangular cross Section, Hollow thin wall torsion members, Multiply connected Cross Section.

Unit –IV:
Contact stresses: Introduction, problem of determining contact stresses, Assumptions on which a solution for contact stresses is based; Expressions for principal stresses; Method of computing contact stresses, Deflection of bodies in point contact; Stresses for two bodies in contact over narrow rectangular area (Line contact) Loads normal to area, Stresses for two bodies in line contact, Normal and Tangent to contact area.

Unit –V:
Introduction to Three Dimensional Problems: Uniform stress stretching of a prismatical bar by its own weight twist of circular shafts of constant cross section, pure bending of plates.

Textbooks:

References:
1. Advanced strength of materials by Den Hortog J.P.
3. Strength of materials & Theory of structures (Vol I & II) by B.C Punmia
4. Strength of materials by Sadhu singh
JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech./M. Tech.ECE I-Semester

MECHATRONICS
(PGE-II)

UNIT-I
INTRODUCTION: Definition – Trends – Control Methods Standalone, PC Based (Real Time Operating Systems, Graphical User Interface, Simulation) – Applications: SPM, Robot, CNC, FMS, CIM.


UNIT –II


UNIT-III


UNIT-IV

UNIT – V
Interpolation, PTP, Linear, Circular – Core functionalities – Home, Record position, GOTO
Position – Applications: SPM, Robotics.

**TEXT BOOKS:**
1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

**REFERENCES:**
Prerequisite: Automobile Engineering

Course Outcomes: At the end of the course the students will be able to

- The focus of Automotive System Dynamics is to introduce the fundamentals of vehicle dynamics and the performance indices and evaluation criteria of vehicles, to analyze the influence of vehicle configuration and design parameters on vehicle performance.

UNIT I:

UNIT II:
Three dimensional Mechanisms, Multi-Body Systems Design, Introduction to 3D vehicle design.

UNIT III:
Suspension Design: Computer models using Bond Graph Technology, Drive train dynamics, vehicle performance

UNIT IV:

UNIT V:
Wheeled Vehicle Handling – Handling control loop, vehicle transfer function, Kinematic behavior of vehicles with rigid wheels and with complaint tyres: Neutral steer point, static margin, over and under-steer. Solution with two degree of freedom in the steady state: Stability factor, characteristic and critical speeds. Tracked Vehicle Handling – Analysis of sprocket torques and speeds, required to skid steer a tracked vehicle. Extension of theory to include three degrees of freedom.

Text Books:

References:
1. Vehicle stability – Dean Karnopp, Dekker Mechanical Engineering
4. Fundamental of Vehicle Dynamics- Gillespie T.D, SAE USA.
JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech./M. Tech.ECE I-Semester

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RANDOM VIBRATIONS
(PGE-II)

Prerequisites: Probability & Statistics, Kinematics of machinery and Dynamics of machinery.

Course outcome: After completing this course, students should be able to

- Apply tools from probabilistic modeling to analyze dynamic systems while accounting for variability and uncertainties that are inevitably present in real engineered systems.
- Classify random excitations as stationary or non-stationary.
- Discuss important properties of random processes.
- Define and compute power spectral density functions.
- Compute auto-and cross-correlation functions, and relate them to power spectral functions.
- Density functions Describe the dynamic response of a multi-degree-of-freedom system to a stochastic excitation.
- Quantify the distributions of peak loads and peak responses from a system subject to stochastic excitation.

UNIT I

PROBABILITY THEORY:
Random Vibrations - Probability distribution and density functions - Excreted values - Conditional probability - Characteristic and log characteristic functions - Chebyshev inequality - Functions of random variables.

UNIT II

RANDOM PROCESSES - I:
Concept of stationary and ergodicity - Evolutionary nonostationary process - Auto and cross correlation and covariance Functions - Mean square limit, differentiability and inerrability - Spectral decomposition.

UNIT III

RANDOM PROCESSES - II:

UNIT IV

RANDOM VIBRATIONS - I:
Response of linear single and multi - degree of freedom systems to stationary excitation - Response of continuous systems - Normal mode method.

UNIT V

RANDOM VIBRATIONS - II:
Level crossing, peak and envelop statistics - First excursion and fatigue.

Text Books :

References:
THEORY OF ELASTICITY
(PGE-II)

UNIT-I

UNIT-II
Two dimensional problems in rectangular co-ordinates-solution by polynomials - saint-vanant’s principle-determination of displacements-bending of simple beams-application of corier series for two dimensional problems-gravity loading.

UNIT-III
Two dimensional problems in polar coordinates - stress distribution symmetrical about an axis - pure bending of curved bars - strain components in polar coordinates – displacements - displacement for symmetrical stress distribution - simple symmetric and asymmetric problems - general solution of two-dimensional problem in polar coordinates - application of general solution in polar coordinates.

UNIT-IV

UNIT-V
Torsion of Prismatic Bars - torsion of prismatic bars - bars with elliptical cross sections - other elementary solution - membrane analogy - torsion of rectangular bars-solution of torsional problems by energy method - use of soap films in solving torsion problem - hydro dynamical analogies - torsion of shafts, tubes, bars etc.

UNIT-V

Text Books:
1. Theory of Elasticity by Timeshanko, McGrawhill Publications
References:
JNTUH COLLEGE OF ENGINEERING HYDERABAD

IV Year B.Tech./M. Tech.ECE I-Semester

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STRUCTURAL MECHANICS & ROBOTICS LAB

STRUCTURAL MECHANICS
1. Determination of deflection, principal and Von-mises stresses in plane stress, plane strain and Axi-symmetric components.
2. Determination of stresses in 3D and shell structures (at least one example in each case)
3. Study state heat transfer analysis of plane and axi-symmetric components.
4. Truss analysis using FEA software.
5. Beam analysis using FEA software.
6. Frame analysis using FEA software.
7. Buckling analysis using FEA software.
8. Harmonic analysis using FEA software.
10. Analysis of laminated composite using FEA software.
11. Coupled field analysis using FEA software.
12. Modal analysis
13. Transient dynamic analysis

ROBOTICS LAB
16. Writing and running robot programs using Robo-X.
17. Experiments using limit switch, optical sensor, read sensor, inductive proximity sensor. Thermocouple and RTD.
18. Experiments using Pneumatic systems.
20. Demonstration of Automation work cell used for tablet manufacturing.

****
COURSE SYLLABUS

Forskningsmetodik med inriktning mot ingenjörsvetenskap

Research Methodology with Emphasis on Engineering Science

7,5 ECTS credit points (7,5 högskolepoäng)

1 Course title and credit points
The course is titled Research Methodology with Emphasis on Engineering Science/Forskningsmetodik med inriktning mot ingenjörsvetenskap and awards 7,5 ECTS credits. One credit point (högskolepoäng) corresponds to one credit point in the European Credit Transfer System (ECTS).

2 Decision and approval
This course is established by Department of Mechanical Engineering 2013-04-30. The course syllabus is approved by School of Engineering and applies from 2013-07-01.

3 Objectives
The goal of the course is to give a fundamental introduction to modern approach to science, particularly to nature and engineering sciences. The course gives also an insight on history and philosophy of science and how the scientific methods could be applied in electrical and mechanical engineering. After the course the students should be able to carry on research projects and write a scientific report.

4 Content
PART 1: Theory, 2.5 ECTS credits
• History of science. A way from experience facts to experimentalism and bring up questions at issues as observations, experimental attempt, induction and deduction.
• Modern theory of science: falsificationism, Kuhn’s paradigm, Lakato’s research programmes, Feyerabend’s anarchistic theory of science, subjective Bayesians, and new experimentalism.
• Principle of scientific methods.
• How to organise and write thesis/scientific report
• Legal and ethical aspects of research.
• Modern search tools for scientific sources.

PART 2: Project/Seminar, 5 ECTS credits
• Approaching research problem - a research question and hypothesis
• Validation and verification of research hypothesis
• Content of research report
• Using journal and conference templates
• Presenting and disputing of research results
• Reviewing of the research reports.
• Project management – project plan, milestones and deliveries
• Team work management

5 Aims and learning outcomes
After the course the students should be able to:
• have understanding for fundamental concept and theory concerning modern paradigm in science, special in natural and engineering sciences
• have a knowledge in scientific history and philosophy
• apply scientific methods within engineering
• write, present and dispute scientific papers and reports
• analyse, review and oppose scientific papers and reports
• use search tools and sources to base the research on scientific content
• cooperate within a project group and apply project management tools.

6 Generic skills
The following skills are practiced:
• Scientific writing.
• Analysis and synthesis ability.
• Research competence.

7 Learning and teaching
The teaching comprises lectures, group assignments and seminars.
Education and its contents will in extent be aimed against needs that arise at practice of the engine trade.
The teaching language is English.

8 Assessment and grading
Examination of the course

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<thead>
<tr>
<th>Code</th>
<th>Module</th>
<th>Credit</th>
<th>Grade</th>
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<tbody>
<tr>
<td>1310</td>
<td>Written examination</td>
<td>2.5 ECTS</td>
<td>A-F</td>
</tr>
<tr>
<td>1320</td>
<td>Project</td>
<td>5 ECTS</td>
<td>G-D</td>
</tr>
</tbody>
</table>

The course will be graded A Excellent, B Very good, C Good, D Satisfactory, E Sufficient, FX Insufficient, supplementation required, F Fail. Examinations can happen continuously during the course, by test at the end of the course or through a combination of these two forms. Examinations can be oral and/or written.
In order to get grade 3 or higher the student has to show clearly that the faith spirit objectives been achieved. If grade Fx are given, the student may after consultation with the course coordinator / examiner get an opportunity to within 6 weeks complement to grade E for the specific course element.

9 Course evaluation
The course coordinator is responsible for systematically gathering feedback from the students in course evaluations and making sure that the results of these feed back into the development of the course.

10 Prerequisites
Completed studies of at least 180 credits in the field of technology.

11 Field of education and subject area
The course is part of the field of education Technology and is included in the subject area Mechanical Engineering. The course can also be included in the subject area Electrical Engineering.

12 Restrictions regarding degree
The course cannot form part of a degree with another course, the content of which completely or partly corresponds with the contents of this course.

13 Course literature and other teaching material
Compulsory literature:
Compendia (provided by a teacher) Internet
Data basis

Complementary literature:
COURSE SYLLABUS

Strukturnanalys

Structural Analysis

7,5 ECTS credit points (7,5 högskolepoäng)

1 Course title and credit points
The course is titled Structural Analysis/Strukturnanalys and awards 7,5 ECTS credits. One credit point (högskolepoäng) corresponds to one credit point in the European Credit Transfer System (ECTS).

2 Decision and approval
This course is established by Department of Mechanical Engineering 2013-11-20. The course syllabus was revised by School of Engineering and applies from 2013-11-20.

3 Objectives
The course shall provide knowledge and proficiency of fundamental methods and tools for computational and experimental structural analysis to support design decisions in product development.
• apply Fourier and Laplace transforms in a mechanical context.

4 Content
The product development process, prototyping, virtual and physical modeling, simulation and experimentation.
Approximate methods in engineering, algorithms and programming.
Software for technical calculations, introduction to MATLAB.
Physical phenomena treated as signals. Mathematical methods, Fourier and Laplace transforms.

5 Aims and learning outcomes
On completion of the course the student will be able to:
• use MATLAB to create useful functions for Structural Analysis.
• apply basic signal processing tools on mechanical signals.

6 Generic skills
The following generic skills are trained in the course:
• analytical thinking
• systematic approach to a problem

7 Learning and teaching
The teaching is in English, using lectures, demonstrations and assignments. The individually submitted assignments are discussed in close relation with the student until full understanding is reached.

8 Assessment and grading

<table>
<thead>
<tr>
<th>Code</th>
<th>Module</th>
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</thead>
<tbody>
<tr>
<td>1405</td>
<td>Written test</td>
<td>3 ECTS</td>
<td>A-F</td>
</tr>
<tr>
<td>1415</td>
<td>Assignments[1]</td>
<td>4.5 ECTS</td>
<td>G-U</td>
</tr>
</tbody>
</table>

Examination of the course
To get final credits for the course all assignments must be passed. The course will be graded A Excellent, B Very good, C Good, D Satisfactory, E Sufficient, FX Insufficient, supplementation required, F Fail. If grade FX or UX are given, the student may after consultation with the course coordinator / examiner get an opportunity to within 6 weeks complement to grade E or G for the specific course element.

9 Course evaluation
The course coordinator is responsible for systematically gathering feedback from the students in course evaluations and making sure that the results of these feed back into the development of the course.

10 Prerequisites
Bachelor of Science in Mechanical Engineering.

11 Field of education and subject area
The course is part of the field of education and is included in the subject area Mechanical Engineering.

12 Restrictions regarding degree
The course cannot form part of a degree with another course, the content of which completely or partly corresponds with the contents of this course.

13 Course literature and other teaching material
COURSE SYLLABUS

Mekanikensapproximativaberäkningsmetoder 1
Computational Engineering 1

7,5 ECTS credit points (7,5 högskolepoäng)

Course code: MT2526
Educational level: Advanced level
Course level: A1N
Field of education: Technology
Subject group: Mechanical Engineering

Subject area: Mechanical Engineering
Version: 1
Applies from: 2014-01-01
Approved: 2013-12-18
Replaces course syllabus approved: 2009-11-01

1 Course title and credit points
The course is titled Computational Engineering 1/Mekanikensapproximativaberäkningsmetoder 1 and awards 7,5 ECTS credits. One credit point (högskolepoäng) corresponds to one credit point in the European Credit Transfer System (ECTS).

2 Decision and approval
This course is established by Department of Mechanical Engineering 2013-12-18. The course syllabus is approved by School of Engineering and applies from 2014-01-01.

3 Objectives
The students gain knowledge and skills of semi-analytical and numerical calculation methods for extensive engineering analysis in e.g. the product development process. Engineering Tribology, Heat Conduction and Solid Mechanics are the primary fields of application used for introduction of the calculation methods in the course.
The students will develop skills in creating theoretical models, deriving relevant equations and solving equations by appropriate methods. This will give deepened understanding of how existing calculation software works and of their possibilities and limitations. The ability to develop complementary software for special purposes will also be increased. Searching for scientific information and communicating scientific facts and relationships will be thoroughly practiced.

4 Content
This course focuses on one-dimensional problems and gives an introduction and the fundamental theory and skills needed for the continuation course Computational Engineering 2.
The topics covered are described by the keywords below:

5 Aims and learning outcomes
On completion of the course the student will be able to:
• derive a governing one-dimensional differential equation for a given initial or boundary value problem
• solve the given types of equations with specified analytical or numerical methods.
• interpret, validate and communicate calculated results

6 Generic skills
The following generic skills are trained in the course:
• analytical reasoning
• scientific and engineering practice
• ability to work in teams
• oral and written presentation

7 Learning and teaching
Lectures/seminars will be given on the course content.
A number of specified calculation problems will be solved individually and a minor assignment will be solved in groups by the students to facilitate the learning of the theory. The students will develop computer codes for the numerical solution methods necessary to solve the problems given. Advantages and disadvantages of the methods will be discussed in the light of this experience.

8 Assessment and grading

<table>
<thead>
<tr>
<th>Code Module</th>
<th>Credit</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1405 Assignment</td>
<td>4 ECTS</td>
<td>A-F</td>
</tr>
<tr>
<td>1415 Written test</td>
<td>3.5 ECTS</td>
<td>A-F</td>
</tr>
</tbody>
</table>

The course will be graded A Excellent, B Very good, C Good, D Satisfactory, E Sufficient, FX Insufficient, supplementation required, F Fail. If grade FX are given, the student may after consultation with the course coordinator / examiner get an opportunity to within 6 weeks complement to grade E for the specific course element.

9 Course evaluation
The course coordinator is responsible for systematically gathering feedback from the students in course evaluations and making sure that the results of these feed back into the development of the course.

10 Prerequisites
Bachelor of Science in Mechanical Engineering.

11 Field of education and subject area
The course is part of the field of education Technology and is included in the subject area Mechanical Engineering.

12 Restrictions regarding degree
The course cannot form part of a degree with another course, the content of which completely or partly corresponds with the contents of this course.

13 Course literature and other teaching material
• Broman G.: Computational Engineering, Department of Mechanical Engineering, Blekinge Institute of Technology, 2003.
• Complementary literature from e.g. the University Library.
COURSE SYLLABUS

Ljud- och vibrations analys

Sound and Vibration Analysis

7.5 ECTS credit points (7.5 högskolepoäng)

Course code: ET2545
Educational level: Advanced level
Course level: AIN
Field of education: Technology
Subject group: Electrical Engineering

Subject area: Electrical Engineering
Version: 2
Applies from: 2014-01-01
Approved: 2013-12-18
Replaces course syllabus approved: 2012-02-14

1 Course title and credit points
The course is titled Sound and Vibration Analysis/Ljud- och vibrationsanalys and awards 7.5 ECTS credits. One credit point (högskolepoäng) corresponds to one credit point in the European Credit Transfer System (ECTS).

2 Decision and approval
This course is established by Department for Electrical Engineering 2013-12-18. The course syllabus was revised by School of Engineering and applies from 2014-01-01.

3 Objectives
The course aims at giving the students basic knowledge of sound- and vibration measurements. The course also reflects how modern signal analysis is applied for the measuring of sound and vibrations. The student will be well prepared for sound- and vibration measuring within the industry as well as for continued studies in the subject.

4 Content
- Mechanical systems
- Transducers for noise and vibration analysis
- Frequency analysis
- Experimental frequency analysis
- Spectrum estimation using the FFT
- The FFT-analyzer
- Frequency response measurements
- Rotating machinery analysis

5 Aims and learning outcomes
On completion of the course the student will:
- be able to understand and use the basic theory for dynamic systems in mechanics.
- have acquired a basic understanding of modal analysis.
- be able to understand and analyze measurement-technical problems in sound- and vibration measuring.
- have knowledge of different measuring methods and sensors that are used for the measuring of sound and vibrations.
- be able to measure and interpret sound- and vibration spectra.
- be able to measure frequency responses and coherence functions.
- be able to use a frequency analyzer.
- have acquired a basic understanding of revolution-per-minute (RPM) analysis in order to understand and solve vibration- and noise problems in relation to rotating machines.
6 Generic skills
The following generic skills are trained in the course:
• Skill in analysis and synthesis
• Skill in applying the knowledge in practice
• Solution of problems
• Team working
• Academic writing

7 Learning and teaching
The teaching comprises lectures and project work. During the lectures the teacher introduces the theoretical foundations and connects the theory to practical applications in the industry. In the project work the student is able to practise the theoretically acquired knowledge and learn how to handle data acquisition systems and advanced measuring instruments for sound- and vibration measurements. The project work is compulsory and will be carried out individually or in a group. The project work includes the presentation of the work in the form of a report. In order for the student to practise theory, theoretical assignments are handed in. The assignments that are handed in are compulsory and must be done individually.

The teaching language is English.

8 Assessment and grading

<table>
<thead>
<tr>
<th>Code</th>
<th>Module</th>
<th>Credit</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1405</td>
<td>Written exam[1]</td>
<td>3.5 ECTS</td>
<td>A-F</td>
</tr>
<tr>
<td>1415</td>
<td>Project</td>
<td>3 ECTS</td>
<td>G-U</td>
</tr>
<tr>
<td>1425</td>
<td>Assignment</td>
<td>1 ECTS</td>
<td>G-U</td>
</tr>
</tbody>
</table>

1 Determines the final grade for the course, which will only be issued when all components have been approved.
The course will be graded A Excellent, B Very good, C Good, D Satisfactory, E Sufficient, FX Insufficient, supplementation required, F Fail. If grade FX or UX are given, the student may after consultation with the course coordinator / examiner get an opportunity to within 6 weeks complement to grade E or G for the specific course element.

1 Determines the final grade for the course which will not be issued until all items have been passed. The examination will take place through a written examination and of the handing in of the compulsory assignments and of the project work assignments. Grading of the project work assignments will be done through the grades Godkänd [Passed] or Underkänd [Failed]. For a final grade of the course the grade Godkänd [Passed] is required for the project work part and also for the assignments that are to be handed in.

Upon request grades may also be given in accordance with the ECTS.

9 Course evaluation
The course coordinator is responsible for systematically gathering feedback from the students in course evaluations and making sure that the results of these feed back into the development of the course.

10 Prerequisites
For admission to the course the following course is required:
- Signal Processing I, ET1203, 7.5 credit points or the equivalent.

11 Field of education and subject area
The course is part of the field of education and is included in the subject area Electrical Engineering.

12 Restrictions regarding degree
The course cannot form part of a degree with another course, the content of which completely or partly corresponds with the contents of this course.

13 Additional information
The course can also be linked to Mechanical Engineering.

14 Course literature and other teaching material

COURSE SYLLABUS

Mekanikensapproximativaberäkningsmetoder 2
Computational Engineering 2
15 ECTS credit points (15 högskolepoäng)

Course code: MT2527
Educational level: Advanced level
Course level: A1F
Field of education: Technology
Subject group: Mechanical Engineering

Subject area: Mechanical Engineering
Version: 1
Applies from: 2013-07-01
Approved: 2013-04-30
Replaces course syllabus approved: 2009-11-01

1 Course title and credit points
The course is titled Computational Engineering 2/Mekanikensapproximativaberäkningsmetoder 2 and awards 15 ECTS credits. One credit point (högskolepoäng) corresponds to one credit point in the European Credit Transfer System (ECTS).

2 Decision and approval
This course is established by Department of Mechanical Engineering 2013-04-30. The course syllabus is approved by School of Engineering and applies from 2013-07-01.

3 Objectives
The students gain knowledge and skills of semi-analytical and numerical calculation methods for extensive engineering analysis in e.g. the product development process. Engineering Tribology, Heat Conduction and Solid Mechanics are the primary fields of application used for introduction of the calculation methods in the course.

The students will develop skills in creating theoretical models, deriving relevant equations and solving equations by appropriate methods. This will give deepened understanding of how existing calculation software works and of their possibilities and limitations. The ability to develop complementary software for special purposes will also be increased. Searching for scientific information and communicating scientific facts and relationships will be thoroughly practiced.

4 Content
This course builds on the course Computational Engineering 1 and extends on multi-dimensional problems.

The topics covered are described by the keywords below:

5 Aims and learning outcomes
On completion of the course the student will be able to:
• derive governing multi-dimensional nonlinear coupled differential equations for a given initial and/or boundary value problem
• solve the given types of equations with specified semi-analytical or numerical methods. • interpret, validate and present calculated results

6 Generic skills
The following generic skills are trained in the course:
• analytical reasoning
• scientific and engineering practise  
• ability to work in teams  
• oral and written presentation  

7 Learning and teaching  
Lectures/seminars will be given on the course content. A number of specified calculation problems will be solved individually and a major assignment will be solved in groups by the students to facilitate the learning of the theory. The students will develop computer codes for the numerical solution methods necessary to solve the problems given. Advantages and disadvantages of the methods will be discussed in the light of this experience.

8 Assessment and grading  

Examination of the course

<table>
<thead>
<tr>
<th>Code Module</th>
<th>Credit</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1310 Assignment</td>
<td>7.5 ECTS</td>
<td>A-F</td>
</tr>
<tr>
<td>1320 Written test (week exam)</td>
<td>7.5 ECTS</td>
<td>A-F</td>
</tr>
</tbody>
</table>

The course will be graded A Excellent, B Very good, C Good, D Satisfactory, E Sufficient, FX Insufficient, supplementation required, F Fail. If grade Fx are given, the student may after consultation with the course coordinator / examiner get an opportunity to within 6 weeks complement to grade E for the specific course element.

9 Course evaluation  
The course coordinator is responsible for systematically gathering feedback from the students in course evaluations and making sure that the results of these feed back into the development of the course.

10 Prerequisites  
MT2405 Computational Engineering 1.

11 Field of education and subject area  
The course is part of the field of education and is included in the subject area Mechanical Engineering.

12 Restrictions regarding degree  
The course cannot form part of a degree with another course, the content of which completely or partly corresponds with the contents of this course.

13 Course literature and other teaching material  
• Broman G.: Computational Engineering, Department of Mechanical Engineering, Blekinge Institute of Technology, 2003.
• Complementary literature from e.g. the University Library.
COURSE SYLLABUS

Experimental Modal Analysis

7,5 ECTS credit points (7,5 högskolepoäng)

1 Course title and credit points
The course is titled Experimental Modal Analysis/Experimentellmodalanalys and awards 7,5 ECTS credits. One credit point (högskolepoäng) corresponds to one credit point in the European Credit Transfer System (ECTS).

2 Decision and approval
This course is established by Department for Electrical Engineering 2013-04-30. The course syllabus was revised by School of Engineering and applies from 2013-07-01. Reg.no: BTH 4.1.1-0318-2013. The course replaces ET2528.

3 Objectives
The course shall provide knowledge and proficiency of fundamental methods and tools for characterization of mechanical structures, including experimental modal analysis and system simulation.

4 Content
- Single and multiple degrees of freedom systems
- The modal concept in analytical and matrix formulation
- Damping models
- Modal parameters and Frequency Response Function connection
- Practical aspects on Frequency Response Function measurements
- Modal parameter extraction
- Multiple references
- Structural modification, Substructure coupling
- Correlation with Finite Element Analysis

5 Aims and learning outcomes
On completion of the course the student will be able to:
- specify an experimental modal analysis on mechanical structures.
- perform experimental modal analysis on mechanical structures, including selection and mounting of transducers, selection and mounting of an exciter, data acquisition and parameter extraction.
- perform simulations of mechanical systems using parameters from numerical models and/or experiments, for example concerning influence from applied loads and/or simple structural changes.
- use modern software for structural mechanics, including modal parameter extraction, structural modification and correlation with Finite Element Analysis.

6 Generic skills
The following generic skills are trained in the course:
- Capacity for analysis and synthesis
- Capacity for applying knowledge in practice
- Problem solving
- Academic writing
7 Learning and teaching
The teaching consists of lectures and projectwork. In order to further explain the theory and its applications there is a compulsory project task. The project work is compulsory and must be carried in groups. A written report to account for the work forms part of the project task.

8 Assessment and grading

Examination of the course

<table>
<thead>
<tr>
<th>Code Module</th>
<th>Credit</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written exam[1]</td>
<td>3.5 ECTS</td>
<td>A-F</td>
</tr>
<tr>
<td>Project</td>
<td>3 ECTS</td>
<td>G-U</td>
</tr>
<tr>
<td>Assignment</td>
<td>1 ECTS</td>
<td>G-U</td>
</tr>
</tbody>
</table>

1 Determines the final grade for the course, which will only be issued when all components have been approved. The course will be graded A Excellent, B Very good, C Good, D Satisfactory, E Sufficient, FX Insufficient, supplementation required, F Fail. The examination is done through a written exam together with a report of the compulsory project work assignments. For a final grade of the course, the grade of Pass is required for the project part. The final grade will be the same as the examination grade. If grade FX are given, the student may after consultation with the course coordinator / examiner get an opportunity to within 6 weeks complement to grade E for the specific course element.

9 Course evaluation
The course coordinator is responsible for systematically gathering feedback from the students in course evaluations and making sure that the results of these feed back into the development of the course.

10 Prerequisites
Required course for admission to this course: ET2529 Sound and Vibration Analysis, 7.5 credit points.

11 Field of education and subject area
The course is part of the field of education and is included in the subject area Electrical Engineering.

12 Restrictions regarding degree
The course cannot form part of a degree with another course, the content of which completely or partly corresponds with the contents of this course.

13 Additional information
In addition to the prerequisites for the course it is recommended to haven the course Signal Processing II, ET1303 or the equivalent. The course can also be included in the Mechanical Engineering field.

14 Course literature and other teaching material