ACADEMIC REGULATIONS
COURSE STRUCTURE
AND DETAILED SYLLABUS

AEROSPACE ENGINEERING

B.TECH. FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2011-12)

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING
L.B.ReddyNagar :: MYLAVARAM – 521 230 :: Krishna District
Andhra Pradesh State

B.TECH (AEROSPACE ENGINEERING), A.Y.2011-2012
ACADEMIC REGULATIONS FOR AUTONOMOUS STREAM  
(2012-2013 Batch)  
(Common to all branches)  
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1. **INTRODUCTION**

Academic Programmes of the institute are governed by rules and regulations approved by the Academic Council, which is the highest Academic body of the Institute. These academic rules and regulations are applicable to the students admitted during academic year 2010-11 into first year of four year undergraduate programme offered by the college leading to Bachelor of Technology (B.Tech) degree in the disciplines viz., Computer Science and Engineering, Electronics and Communication Engineering, Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Information Technology, Mechanical Engineering.

1.1 LakireddyBalireddy College of Engineering, Mylavaram, an autonomous institution, follows Semester pattern for all four years of its undergraduate B.Tech programmes with internal and external evaluation.

1.2 **Semester Pattern** : Each academic year shall be divided into two semesters, each of 20 week duration, including instruction, evaluation, etc. Each semester consists of a minimum of 90 instruction days with at least 35 to 40 contact periods per week.

2. **PROGRAMMES OFFERED (UNDER GRADUATE)**

Presently, the college is offering Under Graduate Programmes in the following disciplines:

- Aero Space Engineering (AE)
- Civil Engineering (CE)
- Computer Science and Engineering (CS)
- Electronics and communication Engineering (EC)
- Electrical and Electronics Engineering (EE)
- Electronics and instrumentation Engineering (EI)
- Information Technology (IT)
- Mechanical Engineering (ME)

3. **ELIGIBILITY CRITERIA FOR ADMISSION**

* The eligibility criteria for admission into 1st year B.Tech programme shall be as mentioned below:
* Admissions in each programme in the Institution are classified into **CATEGORY - A** (70% of intake) and **CATEGORY- B** (30% of intake).

3.1 **CATEGORY – A SEATS**:

* The candidate shall be of Indian National
* The candidate should have completed 16 years of age as on 31st December of the Academic year for which the admissions are being conducted.
* The candidate should have passed the qualifying examination (10+2) or equivalent on the date of his/her counseling for admission and secured the
rank at the Common Entrance Test conducted by the State and also satisfy other conditions laid down in the G.O.s.

* The candidate should satisfy Local/Non-Local status requirement as laid down in the Andhra Pradesh Educational Institutions (Regulation of Admissions) Order, 1974 as subsequently amended.

3.2.1 CATEGORY - B SEATS:

* The candidate shall be of Indian National or a Non-Resident Indian.

* The candidate should have completed 16 years of age as on 31st December of the Academic year for which the admissions are being conducted.

* Category B Seats shall be thrown open for admission to all the eligible candidates on the basis of merit from within the state, other states, Union territories and NRI/NRI sponsored candidates.

* Out of the 30% quota of Category B Seats, seats not exceeding 15% of the sanctioned intake in each course shall be filled on merit basis with NRI/NRI sponsored candidates (vide G.O.Ms.140 HE Dept Dt:31.07.08), who have passed qualifying examination with not less than 50% of aggregate marks or Cumulative Grade Point Average (CGPA) equivalent to 5 on a scale of 10.

* The remaining 15% of seats and the leftover seats after filling NRI/NRI sponsored candidates shall be filled with candidates from within state as per the merit order (EAMCET/AIEEE) interpreted by a Division Bench of Hon'ble High Court of AP in W.P. No.17385/2009 dt.:18-09-2009, which is put on website. Only thereafter if any still remain unfilled the colleges can fall back upon the option of filling up such vacant seats with candidates who have qualified at the qualifying examination.

F

3.3 CATEGORY: LATERAL ENTRY

* The candidates should have passed the qualifying exam.(B.Sc. graduation & Diploma holders) shall be admitted into the II nd year Ist semester directly, based on the rank secured by the candidate at Engineering Common Entrance Test (ECET (FDH)) in accordance with the instructions received from the Convener, ECET and Government of Andhra Pradesh. The candidate shall also satisfy any other eligibility requirements stipulated by the JNT University and / or the Government of Andhra Pradesh from time to time.
4. **AWARD OF B.TECH DEGREE**

A student will be declared eligible for the award of the B.Tech. by JNTUK Degree if he/she fulfills the following academic regulations:

(i) Pursued a course of study for not less than four academic years and not more than eight academic years.

(ii) Registered for 220 credits and secured 212 credits with specified compulsory subjects

**COMPULSORY SUBJECTS**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Specified Particulars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>All the first year subjects</td>
</tr>
<tr>
<td>2.</td>
<td>All Practical Subjects</td>
</tr>
<tr>
<td>3.</td>
<td>Internship</td>
</tr>
<tr>
<td>4.</td>
<td>Comprehensive viva-voce</td>
</tr>
<tr>
<td>5.</td>
<td>Seminar</td>
</tr>
<tr>
<td>6.</td>
<td>Project Work</td>
</tr>
<tr>
<td>7.</td>
<td>Mini Project</td>
</tr>
</tbody>
</table>

5. **DURATION OF THE PROGRAMME**

Students, who fail to fulfil all the academic requirements for the award of the degree within minimum of eight academic years shall forfeit their seat in B.Tech course.

6. **SEMESTER –WISE DISTRIBUTION OF CREDITS**

**TABLE .1 SEMESTER-WISE CREDITS DISTRIBUTION**

<table>
<thead>
<tr>
<th>SEMESTER</th>
<th>CSE</th>
<th>IT</th>
<th>ECE</th>
<th>EIE</th>
<th>EEE</th>
<th>ME</th>
<th>AE</th>
<th>CE</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>28</td>
<td>27</td>
<td>27</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>III</td>
<td>28</td>
<td>28</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>28</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>IV</td>
<td>30</td>
<td>30</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>30</td>
<td>30</td>
<td>29</td>
</tr>
<tr>
<td>V</td>
<td>30</td>
<td>28</td>
<td>31</td>
<td>31</td>
<td>31</td>
<td>27</td>
<td>27</td>
<td>29</td>
</tr>
<tr>
<td>VI</td>
<td>28</td>
<td>30</td>
<td>28</td>
<td>28</td>
<td>28</td>
<td>31</td>
<td>31</td>
<td>29</td>
</tr>
<tr>
<td>VII</td>
<td>32</td>
<td>32</td>
<td>31</td>
<td>31</td>
<td>31</td>
<td>32</td>
<td>32</td>
<td>30</td>
</tr>
<tr>
<td>VII</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>22</td>
</tr>
<tr>
<td>TOTAL</td>
<td>220</td>
<td>220</td>
<td>220</td>
<td>220</td>
<td>220</td>
<td>220</td>
<td>220</td>
<td>220</td>
</tr>
</tbody>
</table>
(i) There shall be an internship of four weeks duration (summer vacation) in an industry/top academic institutes or R & D centers of excellence at the end of the VI semester.

(ii) The internships shall be supervised by a competent faculty member of the institute who in turn shall be in touch with the respective division head of the industry. The internships are compulsory and are credit based.

(iii) All the seminars, Term Paper and mini projects are credit based.

7. DISTRIBUTION AND WEIGHTAGE OF MARKS:

(i) In each semester the course of study consists of 5 theory subjects + 3 laboratories or 6 theory subjects + 2 laboratories. However, in the VIII semester there shall be only 3 theory subjects in addition to the project work and comprehensive viva-voce.

(ii) The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition, internship, seminar, Term Paper, Project work and Comprehensive Viva-Voce shall be evaluated for 50, 50, 50, 200 and 100 marks respectively.

(iii) For each theory subject the distribution shall be 25 (20+5 marks for attendance) marks for Internal Evaluation and 75 marks for the end semester examination.

(iv) For each theory subject, during each semester there shall be 2 tests, for duration of 90 minutes. One descriptive test to be conducted in 1 – 2 units and the second test are conducted in 3 – 5 units thereby. However, 75% weightage for the best and 25% for the other first test shall be considered for awarding sessional marks.

(v) The question paper for internal examinations shall contain 3 questions and each question consists of internal choice.

(vi) For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks (10 marks for day-to-day work, 10 marks for Internal test and 5 marks for attendance) and 75 end examination marks. The end examination shall be conducted by the teacher concerned and another external member.

(vii) For the subject having design and / or drawing (such as Engineering Graphics, machine Drawing), and estimation, the distribution shall be 25 marks for internal evaluation (10 marks for day-to-day work, 10 marks for Internal tests and 5 marks for attendance) and 75 marks for end examination. There shall be one internal test in a Semester.

(viii) All project works / internships / mini projects shall be evaluated by the committee. The committee consists of, head of the department, the supervisor of mini project and a senior faculty member of the department along with duly approved / recognized external examiner.

(ix) There shall be seminars in the III semester and V semester and Term Paper in VII semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over
the topic, and submit to the department, which shall be evaluated by the Department committee consisting of Head of the department, seminar supervisor and a senior faculty member. The Term Paper / Seminar report shall be evaluated for 50 marks.

(x) Out of a total 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination. The internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project. The End Semester Evaluation (viva-voce) shall be conducted by the same committee appointed for internship evaluation. The topics for mini project, seminar and project work shall be different from each other. The topic for Term Paper and Project work can be same. The evaluation of project work shall be conducted at the end of the VIII Semester.

(xi) The comprehensive viva shall be conducted for 100 marks both in VI semester and VIII Semesters. The comprehensive viva shall be evaluated in the topics covering the core aspects of the subject in which the candidate is likely to graduate.

8. ATTENDANCE REGULATIONS AND CONDONATION:

(i) A student shall be eligible to appear for end semester examinations, if acquired a minimum of 75% of attendance in aggregate of all the subjects.

(ii) Condonation of shortage of attendance in aggregate up to 10% on medical grounds (65% and above and below 75%) in each semester may be granted by the College Academic Committee. However, the subject of granting is purely at the discretion of the College Academic Committee or competent authority.

(iii) A Student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester as applicable. They may seek re-admission for that semester as and when offered next.

(iv) Due weightage in each of the subjects shall be given to the attendance. Marks not exceeding 5 shall be given to all such candidates who satisfies the following criteria

<table>
<thead>
<tr>
<th>% of attendance</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;= 90</td>
<td>5</td>
</tr>
<tr>
<td>85 to &lt;90</td>
<td>4</td>
</tr>
<tr>
<td>80 to &lt; 85</td>
<td>3</td>
</tr>
<tr>
<td>&gt;75 to &lt; 80</td>
<td>2</td>
</tr>
<tr>
<td>=75</td>
<td>1</td>
</tr>
</tbody>
</table>

(v) Shortage of Attendance below 65% in aggregate shall in no case be condoned.

(v) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that particular semester and their registration for examination shall stands cancelled.
(vi) A stipulated fee shall be payable towards condonation of shortage of attendance.

(vii) Attendance may also be condoned for those who participate in prestigious sports, co- and extracurricular activities provided their attendance is in the minimum prescribed range for the purpose and recommended by the concerned authority.

9. **MINIMUM ACADEMIC REQUIREMENTS:**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.8.

(i) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical design or drawing subject or project if he/she secures not less than a minimum of 40% of marks exclusively at the end semester examinations in each of the subjects in which candidate had appeared. However, the candidate should have secured minimum of 40% marks in both external and internal components put together to be eligible for passing in the subject.

(ii) A student will be promoted to next semester, if he satisfies the minimum attendance requirement.

(iii) Only such candidates who had completed their II Semester to III Semester of study and had obtained at least 40 credits (50% of the total credits up to III Semester) are eligible to study V Semester.

(iv) To be eligible to study VII Semester, the candidate should have secured a minimum of 68 credits (50% of the total credits up to V Semester).

(v) There shall be supplementary examinations along with the regular even semester examinations enabling the students to give a fair chance to appear in the subject if failed any.

(vi) However, an advanced supplementary examination shall be conducted for all such students who had failed in only one subject at the VII Semester of their study. Such an examination is applicable only for those students pursuing VIII semester.

(vii) Students who fail to earn 212 credits as indicated in the course structure including compulsory subjects as indicated in table – I within eight academic years from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

(viii) The examination Committee shall approve application of promotion rules as specified above under clauses (iii) and (iv) for each academic batch.
10. **COURSE PATTERN:**

(i) The entire course of study is of four academic years. Each academic year shall have two semesters

(ii) A Student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject as and when conducted.

(iii) All admitted students' are to study 4 electives during their course of four year study at the institute. The following shall be the programme of study of electives.

<table>
<thead>
<tr>
<th>Year</th>
<th>Semester</th>
<th>No. of electives</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

(iv) During the VIII semester, it is mandatory that departments offer 3 theory subjects and a comprehensive viva (covering all core subjects of engg) along with project work.

(v) When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted when the semester is offered after fulfillment of academic regulations. Whereas the academic regulations hold good with the regulations he/she first admitted.

11. **AWARD OF CLASS:**

After a student has satisfied the requirement prescribed for the award of B.Tech. Degree, he/she shall be placed in one of the following four grades. The award of the degree is based on CGPA on a grade point of scale 4. The grade points are awarded as follows:

<table>
<thead>
<tr>
<th>CGPA</th>
<th>Award of Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;=3</td>
<td>First Class with Distinction</td>
</tr>
<tr>
<td>&gt;=2.4 and &lt;3</td>
<td>First Class</td>
</tr>
<tr>
<td>&gt;2 and &lt;2.4</td>
<td>Second Class</td>
</tr>
<tr>
<td>&gt;=1.6 and &lt; 2</td>
<td>Pass Class</td>
</tr>
<tr>
<td>&lt; 1.6</td>
<td>Fail</td>
</tr>
</tbody>
</table>
Based on the performance of the candidate, the following shall be the criteria for the award of letter grades at the end of each semester in the subjects in which the candidate appeared for the examination.

<table>
<thead>
<tr>
<th>Percentage of Marks Scored</th>
<th>Letter Grades</th>
<th>Grade points</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;=90</td>
<td>S</td>
<td>4.00</td>
</tr>
<tr>
<td>&gt;=85 to &lt;90</td>
<td>A+</td>
<td>3.67</td>
</tr>
<tr>
<td>&gt;=80 and &lt;85</td>
<td>A</td>
<td>3.33</td>
</tr>
<tr>
<td>&gt;=75 and &lt;80</td>
<td>B+</td>
<td>3.00</td>
</tr>
<tr>
<td>&gt;=70 and &lt;75</td>
<td>B</td>
<td>2.67</td>
</tr>
<tr>
<td>&gt;=65 and &lt;70</td>
<td>C+</td>
<td>2.33</td>
</tr>
<tr>
<td>&gt;=60 and &lt;65</td>
<td>C</td>
<td>2.00</td>
</tr>
<tr>
<td>&gt;=55 and &lt;60</td>
<td>D+</td>
<td>1.67</td>
</tr>
<tr>
<td>&gt;=50 and &lt;55</td>
<td>D</td>
<td>1.33</td>
</tr>
<tr>
<td>&gt;=40 and &lt;50</td>
<td>E</td>
<td>1.00</td>
</tr>
<tr>
<td>&lt;40</td>
<td>F</td>
<td>0</td>
</tr>
</tbody>
</table>

11.1 Calculation of Grade Points Average (GPA)* for semester

The performance of each student at the end of each semester is indicated in terms of GPA. The GPA is calculated as below:

\[ \text{GPA} = \frac{\sum (CR \times GP)}{\sum CR} \]

Where \( CR \) = Credits of a course
\( GP \) = Grade points awarded for a course

* GPA is calculated for the candidates who passed all the courses in that year/semester.

11.2 Calculation of Cumulative Grade Point Average (CGPA) for Entire Programme.

The CGPA is calculated as below:

\[ \text{CGPA} = \frac{\sum (CR \times GP)}{\sum CR} \]

(for entire programme)

Where \( CR \) = Credits of a course
\( GP \) = Grade points awarded for a course
12. **MINIMUM INSTRUCTION DAYS:**

The minimum instruction for each semester shall be 90 instruction days excluding examination days.

13. **GENERAL:**

(a) Where the words “he” “him” “his”, occur in the regulations, they include “she”, “her”.

(b) The academic regulation should be read as a whole for the purpose of any interpretation.

(c) In the case of any doubts or ambiguity in the interpretation of the above rules, the decision of the Director is final.

(d) The Institute may change or amend the academic regulations or syllabi at any time duly approved by Academic council and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institute.

14. **CHANGE OF BRANCH**

There shall be no branch transfers after the completion of admission process.

15. **TRANSITORY REGULATIONS**

A candidate, who is detained or discontinued in the semester, on readmission shall be required to do all the courses in the curriculum prescribed for such batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed in such courses, which he/she had passed in the earlier semester(s) he/she was originally admitted into.

15.1 A student who is following the JNTU, Kakinada curriculum, detained due to lack of academics/attendance at the end of the first semester of second year, shall join the autonomous batch of III Semester. Such students will study all the courses prescribed for that batch, in which the student joins. The first year marks shall not be converted in to course credits. However, the student has to clear all his first year backlog subjects by appearing the supplementary examinations, conducted by JNTU, Kakinada and courses prescribed in Autonomous stream for the award of Degree. The class will be awarded based on the academic performance of a student. Such candidates will be considered on par with lateral entry candidates of autonomous stream and will be governed by the regulations applicable to lateral entry candidates category.

15.2 A student who is following the JNTU, Kakinada curriculum, detained due to lack of academics/attendance at the end of the second semester of second year and also at the subsequent semesters, shall join with the autonomous batch at the appropriate semester. Such candidates shall be required to pass in all the courses in the programme prescribed by concerned BOS for such batch of students, to be
eligible for the award of degree. However, exemption will be given in all those courses of the semester(s) of the batch, which the candidate joins now, which he/she had passed earlier. The student has to clear all his backlog subjects by appearing the supplementary examinations, conducted by JNTU, Kakinada and College(Autonomous stream) for the award of Degree. The class will be awarded based on the academic performance of a student in the autonomous Pattern.

16. COURSE CODE AND COURSE NUMBERING SCHEME

All the subjects of all the branches are grouped as one pool of subjects. Each theory (o)r Laboratory Course was assigned an unique Number. Theory Subject Code will start with letter ‘T’ and other than theory subject will start with Letter ‘P’.

17. MEDIUM OF INSTRUCTION

The medium of instruction and evaluation is English.

18. AMENDMENTS TO REGULATIONS

The Academic council from time to time may revise, amend, or change the regulations, schemes of examinations, and/or syllabi.

19. ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME)

(i) The students have to acquire 168 credits from III Semester to VIII Semester of B.Tech Programme (Regular) for the award of the degree

(ii) Students, who fail to fulfill the requirement for the award of the degree in 7 consecutive academic years from the year of admission, shall forfeit their seat.

(iii) The same attendance regulations are to be adopted as that of B.Tech (Regular)

19.1 Rules For Promotion into Next Higher Class: (VI Semester to VII Semester )

A student shall be promoted from VI Semester to VII Semester only if he fulfills the academic requirements of 42 credits up to V semester.

19.2. Award of Grade in each semester:

After a student has satisfied the requirement prescribed for the completion of the programme and is eligible for the award of B.Tech. Degree he shall be placed in one of the following four classes:

Based on the performance of every candidate, the following shall be the criteria for the award of grades at the end of each semester.
### Percentage of Marks Scored

<table>
<thead>
<tr>
<th>Percentage of Marks Scored</th>
<th>Letter Grades</th>
<th>Grade points</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;=90</td>
<td>S</td>
<td>4.00</td>
</tr>
<tr>
<td>&gt;=85 to &lt;90</td>
<td>A+</td>
<td>3.67</td>
</tr>
<tr>
<td>&gt;=80 and &lt;85</td>
<td>A</td>
<td>3.33</td>
</tr>
<tr>
<td>&gt;=75 and &lt;80</td>
<td>B+</td>
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Passed on the aggregate marks secured for the best 161 Credits (Lateral Entry). The aggregate marks secured for 168 Credits. (i.e. III Semester to VIII Semester)

#### 20. GRADE CARD

The grade card issued shall contain the following:

a) The credits for each course offered for that semester
b) The letter grade obtained in each course
c) The SGPA/CGPA
d) Total number of credits earned by the student up to the end of that semester

#### 21. CONDUCT AND DISCIPLINE

(a) Students shall conduct themselves within and outside the premises of the Institute in a manner befitting the students of our Institution.

(b) As per the order of Honorable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.

(c) The following acts of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

(i) Lack of courtesy and decorum; indecent behavior anywhere within or outside the campus.

(ii) Willful damage or distribution of alcoholic drinks or any kind of narcotics or of fellow students/citizens.

(d) Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

(e) Mutilation or unauthorized possession of library books.

(f) Noisy and unseemly behavior, disturbing studies of fellow students.
(g) Hacking in computer systems (such as entering into other person’s areas without prior permission, manipulation and/or damage of computer hardware and software or any other cybercrime etc.

(h) Usage of camera cell phones in the campus.

(i) Plagiarism of any nature.

(j) Any other act of gross indiscipline as decided by the academic council from time to time.

(k) Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute / hostel, debarment from an examination, disallowing the use of certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.

(l) For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief Warden, the Head of the Department and the principal respectively, shall have the authority to reprimand or impose fine.

(m) Cases of adoption of unfair means and/or any malpractice in an examination shall be reported to the principal for taking appropriate action.

(n) All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the Academic council.

(o) The Institute Level Standing Disciplinary Action Committee constituted by the academic council, shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.

(p) The Principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the Programmes Committee in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved by the academic council earlier, shall be reported to the academic council for ratification.

(q) “Grievance and Redressal Committee” (General) constituted by the principal shall deal with all grievances pertaining to the academic / administrative /disciplinary matters.

(r) All the students must abide by the code and conduct rules of the college.
22. **MALPRACTICES**

(a) The Principal shall refer the cases of malpractices in internal assessment tests and Semester-End Examinations, to a Malpractice Enquiry Committee, constituted by him/her for the purpose. Such committee shall follow the approved scales of punishment. The Principal shall take necessary action, against the erring students basing on the recommendations of the committee.

(b) Any action on the part of candidate at an examination trying to get undue advantage in the performance at examinations or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff, who are in charge of conducting examinations, valuing examination papers and preparing/keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

23. **AWARD OF RANK**

The rank shall be awarded based on the following:

1.1 Only such candidates who pass the Final Semester examination at the end of the eighth semester (Final Semester) after admission as regular final year students along with the others in their batch and become eligible for the award of the Degree shall be eligible for the award of rank. Candidates, who lose one or more Semesters of study for any reason whatsoever are not eligible for the award of rank.

1.2 Ranks shall be awarded in each branch of study for the top five students appearing for the Regular Examinations.

1.3 Award of prizes, scholarships, or any other Honours shall be based on the rank secured by a candidate, consistent with the guidelines of the Donor, wherever applicable.
### COURSE STRUCTURE

#### I-SEMESTER

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UNIT - I


UNIT - II

Linear differential equations of second and higher order with constant coefficients and with variable coefficients, method of variation of parameters and their simple applications to Simple Harmonic Motion and Electrical Circuits.

UNIT - III

Generalized Mean Value theorems (without proof), Functions of several variables, Maxima and Minima of functions of two variables with constraints and without constraints. Lagrangian Multiplier method.

UNIT - IV

Curve tracing – Cartesian curves. Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian Coordinates. Multiple integrals - double and triple integrals (Cartesian Coordinates only) – Changing of order of Integration. (Cartesian Coordinates only)

UNIT - V


TEXT BOOKS

1. Higher Engineering Mathematics by Dr. B.S. Grewal
2. Higher Engineering Mathematics by Dr. B. V. Ramana – TMGH

REFERENCES

UNIT - I

Algorithm / pseudo code, flowchart, program development steps, structure of C program, A Simple C program, identifiers, basic data types and sizes, Constants, variables, arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation.
Input-output statements, statements and blocks, if and switch statements, loops-while, do-while and for statements, break, continue, goto and labels, programming examples.

UNIT - II

Designing structured programs, Functions, basics, parameter passing, storage classes- extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, header files, C preprocessor, example c programs.

UNIT - III

Arrays- concepts, declaration, definition, accessing elements, storing elements, arrays and functions, two dimensional and multi-dimensional arrays, applications of arrays. pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory managements functions, command line arguments, 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, bitfields, C program examples.

UNIT - V

Input and output – concept of a file, text files and binary files, streams, standard l/o, Formatted l/o, file l/o operations, error handling, C program examples.
TEXT BOOKS

2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education

REFERENCES

3. C and Data Structures:A Snap Shot Oriented Treatise Using Live Engineering Examples by Prof. N.B.Venkateswarlu and, Prof.E.V.Prasad, S Chand & Co, New Delhi
4. C/C++ for Engineers and Scientists, Harry H.Cheng ,McGrawHill,
English Language continues to be regarded as an important tool for global communication and employability. Hence, it is imperative that students need to acquire communicative competence besides their core skills. The syllabus has been designed to develop linguistic and communicative competence of Engineering students with special emphasis on professional and functional aspects of English language i.e., on Listening, Speaking, Reading and Writing (LSRW Skills).

**OBJECTIVES**

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
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- To train students to improve their active and passive vocabulary.
- To familiarize the students with different rhetorical functions of Technical English.
- To enable the students write letters and reports effectively in formal and professional situations.

**UNIT - I**

Chapter – 1: “Read & Proceed” from Step by Step (*Pearson*)
Extensive Reading - Masterminds- The Trailblazers – *Jagadis Chandra Bose* (*Orient Longman*)

**UNIT - II**

Chapter – 2: “Travel” from Step by Step (*Pearson*)
Extensive Reading - Masterminds- The World of Figures and Physics – *Chandra SekharaVenkata Raman* (*Orient Longman*)

**UNIT - III**

Chapter – 3: “Gender” from Step by Step (*Pearson*)
Extensive Reading - Masterminds- The Institution Builders– *Shanti SwarupBhatnagar* (*Orient Longman*)
UNIT - IV

Vocabulary – Synonyms, Antonyms, Words often Confused, Gerunds & Infinitives, Prefixes & Suffixes, Word plurals, Analogy
Grammar – Parts of Speech, Sentence Completion, Question Tags, Tense and Aspect

UNIT - V

Analytical Writing – Sentence Construction – Types of sentences, Exercises with scrambled words & Jumbled sentences, Paragraph writing, Dialogue writing (Formal & Informal), Letter Writing (Formal & Informal), Resume writing, Expansion (of a given topic), Abstract Writing (Summarizing / Synopsis), Decision-making, Drafting E-Mails & Memo writing, Essay writing.

TEXT BOOKS

- Step by Step (Pearson)
- Masterminds by EnakshiChatterjee (Orient Longman)

REFERENCES

UNIT - I


UNIT - II


UNIT - III


UNIT - IV


UNIT - V


TEXT BOOKS

1. Higher Engineering Mathematics by Dr. B.S. Grewal
2. Higher Engineering Mathematics by Dr. B. V. Ramana – TMGH

REFERENCES

1. Introductory Methods of Numerical Analysis by S. S. Sastry – PHI
2. Numerical Methods for Engineers with programming and software application by Steven .C. Chopra and Ra. P. Canale – TMGH
UNIT - I

INTRODUCTION TO ENGINEERING DRAWING:
Curves used in engineering practice:
   a) Conic Sections- Ellipse, Parabola, Hyperbola and rectangular hyperbola-
      General method and other methods.
   b) Cycloid, Epi-Cycloid and Hypo-Cycloid.
   c) Involutes.

UNIT - II

ORTHOGRAPHIC PROJECTIONS:(First angle projection only)

UNIT – III

PROJECTIONS OF PLANES
Planes parallel to one of the reference planes-Inclined to one reference plane and perpendicular to other-Oblique planes.

UNIT – IV

PROJECTIONS OF SOLIDS
Projection of solids in simple position - Axis inclined to one of the reference planes and parallel to the other-Axis inclined to both H.P and V.P.

UNIT - V

SECTIONS OF SOLIDS:
Introduction-Sections of Prisms,Pyramids,Cylinders,Cones and Spheres

TEXT BOOK
Engineering Drawing, N.D. Bhat / Charitor publishers

REFERENCES
2. Engineering Drawing, R.K.Dhawan / S.Chand Company LTD.
1. Write a programme in ‘C’ language to cover the following problems.
   a) Roots of Quadratic Equation.
   b) Example program which shows the usage of various Operators available in C Language.
   c) Example program which shows the usage of various preliminary Data types available in C Language.
   d) Example programs to illustrate the order of evaluation.

II) WRITE EXAMPLE PROGRAMS

a) To check whether the given year is leap year (or) not
b) Converting given two digit number into words using switch statement
c) To illustrate the usage of ‘goto’ statement.
d) Finding smallest& biggest number from the given set of 4 numbers using ‘if’ statement.
e) Calculate the student grade in the examination – assume suitable constraints.
f) Prepare electricity bill for the consumed units – assume suitable constraints.

III) EXAMPLE PROGRAMS

a) To Display first N natural numbers
b) To find whether the given number is Armstrong (or) not
c) To find reverse of the given number and to check whether it is palindrome (or) not.
d) To find whether given number is strong number (or) not.
e) To check whether given number is Prime (or) not
f) To display prime numbers within the given range(Nesting of Loops).
g) To display the following structure(Nesting of Loops)
   i)  
   ii) 

   1 2 3 4 2 1
   1 2 3 4 2 1
   1 2 3 4 5 1
IV) Write example programs in C Language:
   a) To find factorial of a given number using functions.
   b) Swap two numbers using functions.
   c) To find GCD of two numbers using recursion
   d) Write a recursive function to solve Towers of Honai problem.
   e) Write an example program to illustrate use of external & static storage classes.

V) Write example programs in C Language to perform following operations:
   a) Finding the sum and average of given numbers using Arrays.
   b) To display elements of array in reverse order
   c) To search whether the given element is in the array (or) not using linear search & binary search.
   d) Write a C program to perform the following operations
      i) Addition, subtraction and multiplication of Matrices
      ii) Transpose of given matrix (The above operations are to be exercised using functions also by passing arguments)
   e) Write a C program to find whether the given string is palindrome (or) not.
   f) To accept line of text and find the number of characters, number of vowels and number of blank spaces in it.
   g) Write an example program to illustrate the use of any 5 string handling functions.

VI) a) Example program to bring clarity on pointer declaration & initialization and Pointer arithmetic.
   b) Write an example program to describe the usage of call by reference.
   c) Write a program to find sum of the elements of the array using functions.
   d) Write an example program to illustrate the usage of command line arguments.
   e) Program to illustrate the usage of dynamic memory management functions.

VII) a) Write an example program using structures to process the student record. Assume suitable fields for student structures (Different kinds of initialization of structure variables are to be exercised)
   b) Write a program to read records of 10 employees and find their average salary (exercise array of structures & Nested structures concepts through this program).
   c) Write a program to handle a structure variable using pointers and implement self referential structure (i.e. A structure variable having a pointer to itself)

VIII) Write an example program on file to perform following operations:
   a) Accessing content from files and writing content in to it. (Exercise different file operation modes)
   b) Copy the contents of one file into another (Exercise different file operation modes)
UNIT - I

COMPUTER AIDED DRAFTING
Introduction - Computer Aided drafting system – Advantages, Applications of AUTOCAD. Drafting software – AUTOCAD – Advantages, Initial setup commands, utility commands, Drawing Aids, Entity Draw commands, Display commands, Edit Commands.
Introduction Lettering – Basic types of Dimensioning, Linear, Angular and Radial Dimensioning.

UNIT - II

ORTHOGRAPHIC PROJECTIONS:
Introduction to orthographic Projections

UNIT - III

ISOMETRIC DRAWING :

UNIT - IV

DEVELOPMENT OF SURFACES OF SOLIDS:

UNIT - V

INTERSECTION OF SURFACES:

TEXT BOOKS

3. Engineering Drawing, N.D. Bhat / Charitor
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TRADES FOR EXERCISES: (Common to EEE, ECE, CSE, EIE & IT)

At least three exercise from each trade:

1. Carpentry
2. Fitting
3. House – Wiring
4. Plumbing

TRADES FOR EXERCISES: (MECHANICAL ENGINEERING)

At least two exercise from each trade:

1. Carpentry
2. Fitting
3. Tin - Smithy
4. Black - Smithy
5. House - Wiring
6. Plumbing

TEXT BOOK

UNIT – I

Laplace transforms of standard functions – Shifting Theorems, Transforms of derivatives and integrals – Unit step function – Dirac’s delta function. Inverse Laplace transforms – Convolution theorem - Applications of Laplace transforms to ordinary differential equations

UNIT – II


UNIT – III


UNIT – IV


UNIT – V

Z-transform – properties – Damping rule – Shifting rule – Initial and final value theorems -Inverse z-transform -Convolution theorem – Solution of difference equation by z-transforms.

TEXT BOOKS

1. Higher Engineering Mathematics by Dr. B.S. Grewal
2. Higher Engineering Mathematics by Dr. B. V. Ramana – TMGH

REFERENCES

English Language continues to be regarded as an important tool for global communication and employability. Hence, it is imperative that students need to acquire communicative competence besides their core skills. The syllabus has been designed to develop linguistic and communicative competence of Engineering students with special emphasis on professional and functional aspects of English language i.e., on Listening, Speaking, Reading and Writing (LSRW Skills).

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- To train students to improve their active and passive vocabulary.
- To familiarize the students with different rhetorical functions of Technical English.
- To enable the students write letters and reports effectively in formal and professional situations.

**UNIT - I**

Chapter 4: “Disaster Management” from *Step by Step* (Pearson)

Extensive reading – *Masterminds* - The institution builders - MeghanadSaha (Orient Longman)

**UNIT - II**

Chapter 5: “Health” from *Step by Step* (Pearson)

Extensive reading – *Masterminds* - The New Age – HomiJehangirBhabha (Orient Longman)

**UNIT - III**

Chapter 6: “Sports” from *Step by Step* (Pearson)

Extensive reading – *Masterminds* - The New Age – Vikram Sarabhai (Orient Longman)
UNIT - IV

Grammar – Articles, Prepositions, Voice, Speech, Concord, Correction of Sentences
Vocabulary – Phrasal verbs, Gerunds, Infinitives, One word Substitutes.

UNIT - V

Analytical writing – Comprehension, Technical dialogue writing,
Presentation skills - Note making, Information transfer / Data interpretation (Tables, 
Pie-charts, Bar graphs, Tree diagrams, Pictograms, etc.), Report writing

TEXTBOOK

Master Minds, (Orient Longman).

REFERENCES

4. GRE and TOEFL, Kaplan and Baron's, Latest editions.
UNIT - I


UNIT - II

FUELS AND COMBUSTION: Definition and classification of Fuels- conventional fuels (solid, liquid, gaseous), Solid fuels- coal - analysis, Proximate and ultimate analyses of coal – significances, Liquid Fuels – primary- petroleum- refining of petroleum- cracking, knocking, synthetic petrol – Bergius and Fischer Tropsech’s process; Gaseous fuels- octane number – cetane number,– water gas, producer gas CNG, and biogas - gross and net calorific values – (definition only) – flue gas analysis – Orsat’s apparatus.

UNIT - III


UNIT - IV

UNIT - V


2. LUBRICANTS: Introduction to Lubricants, Principles and function of lubricants - Types of Lubrication and Mechanism - Thick Film or Hydrodynamic Lubrication, Thin Film or Boundary Lubrication, Extreme Pressure Lubrication. Classification and properties of lubricants-Viscosity, flash and fire point, cloud and pour point, aniline point, Neutralization Number and mechanical strength, Selection of lubricants.

TEXT BOOKS


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**UNIT - I**


**Resultant of Systems of Forces:** Resultant of Coplanar Concurrent Forces – Resultant of Coplanar Non-Concurrent Forces.

**Moments:** Introduction to Moment, Moment of Force and its Applications, Principle of moments – Couples and Resultant of Force Systems.

**UNIT - II**

**Equilibrium of Systems of Forces:** Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Lami’s Theorem, conditions of equilibrium.

**UNIT - III**

**Friction:** Introduction, Classification of friction, Laws of friction. Co-efficient of friction, Angle of friction, Angle of repose, Frictional forces on motion of bodies, Wedge friction.

**UNIT - IV**

**Centroid:** Centroids of simple figures (from basic principles) – Centroids of Composite Figures

**Centre of Gravity:** Centre of gravity of simple bodies (from basic principles), centre of gravity of composite Bodies.

**UNIT - V**

**Area Moment of Inertia**

Moment of Inertia of a plane figure with respect to an axis in its plane–Moment of inertia with respect to an axis perpendicular to the plane of the figure – Parallel axis theorem, Moment of Inertia of composite figures.

**TEXT BOOKS**


**REFERENCES**

2. Engineering Mechanics / AK Tayal ,Umesh Publications
3. Vector Mechanics for Engineers Statics and Dynamics by Beer and Johnston, TATA Mc Graw Hill.
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**UNIT - I**

**INTERFERENCE:** Superposition of waves-double slit interference- Young’s double slit experiment- Coherence – Interference from thin films- Newton's rings.

**DIFFRACTION:** Diffraction and wave theory of light (Fresnel and Fraunhofer diffractions) - single slit Diffraction, Intensity in single- slit diffraction, Calculating the intensity– Double slit interference and diffraction combined.

**GRATINGS AND SPECTRA** - Multiple slits-width of the maxima, Diffraction gratings, Grating spectrum – Dispersion and Resolving power.

**POLARIZATION:** Polarization by reflection Brewster’s law - Double refraction - Polarization by scattering - Retarders - Optical Activity.

**UNIT - II**

**CRYSTAL STRUCTURES:** Introduction – periodic arrays of atoms-Lattice translation vectors, Basis and crystal structure, Primitive cell, fundamental types of lattices-three dimension lattice types, Crystal systems- Structure and packing fractions of Simple cubic- Body centered cubic- Face centered cubic crystals.

**X-RAY DIFFRACTION:** Directions and planes in crystals – Miller indices – separation between successive ( h k l ) planes- Diffraction of X-rays by crystal planes – Braggs law- Laue method- powder method.

**UNIT - III**


**FIBER OPTICS:** Introduction- Principle of optical Fiber- Acceptance angle and Acceptance cone- Numerical aperture - refractive index profile- Application of optical fibers.

**UNIT - IV**

**SUPER CONDUCTIVITY :** Phenomenon, Meissner effect, critical parameters, Type I, Type II Super conductors, BCS theory of super conductivity, Applications of Super conductors.
UNIT - V


TEXT BOOKS

2. Engineering Physics by V RAJENDRAN Tata McGraill

REFERENCES

1. Introduction to solid state physics, C. Kittel, John wiley, 1999.
2. Engineering physics by H K MALIK AK SINGH TATA McGRAHILL
The English Language Communications Skills Lab focuses on practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts. It aims at improving the communicative competence of students and to enrich their power of expression, articulation and persuasiveness. The thrust is on developing competences, both linguistic as well as communicative, in order to improve employability potential.

**OBJECTIVES**

1. To expose the students to a variety of self-instructional, learner-friendly modes of English language learning and stimulate intellectual and attitudinal exercise.
2. To provide students with the required facility and practice to face computer-based competitive exams such GRE, TOEFL, IELTS etc.
3. To enable them to learn better pronunciation through emphasis on word accent, intonation, and rhythm.
4. To train them to use language effectively to face interviews, group discussions, public speaking.
5. To develop necessary attitudes and behaviors so as to improve their employability quotient.

**SYLLABUS**

The following course content is prescribed for the English Language Communication Skills Laboratory sessions:

1. Dimensions of Phonetics: Phonetic Transcription, Sounds, Stress, Intonation, Rhythm, Varieties of Spoken English: Indian, British and American
2. Oral Presentations -- Prepared and Extempore -- JAM
3. Role Play
4. Describing Objects / Situations / People
5. Information Transfer
6. Debates
7. Group Discussions
SUGGESTED SOFTWARE/BOOKS

* Digital Mentor, Globarena, Hyderabad, 2005
* Sky Pronunciation Suite: Young India Films, Chennai, 2009
* Mastering English in Vocabulary, Grammar, Spelling, Composition, Dorling Kindersley, USA, 2001
* Dorling Kindersley Series of Grammar, Punctuation, Composition, Dorling Kindersley, USA, 2001
* Learning to Speak English - 4 CDs. The Learning Company, USA, 2002
* Krishna Mohan, Effective English Communication, Tata McGraw Hills, New Delhi, 2007
P830
ENGINEERING PHYSICS
AND CHEMISTRY LAB
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ENGINEERING PHYSICS LABORATORY
(Any 5 experiments)

LIST OF EXPERIMENTS

1. LCR Resonance circuit
2. Newton’s Rings – Determination of Radius of curvature of plano convex lens
3. Verification of laws by using sonometer
4. Meldy’s experiment
5. Wedge shaped film
6. Volume Resonator
7. Refractive index of light
8. Diffraction Grating – Normal incidence method
9. Rigidity modulus of a given wire
10. Frequency of AC supply – Sonometer

ENGINEERING CHEMISTRY LABORATORY
(Any 5 experiments)

1. Estimation of total Hardness of water by EDTA method
2. Determination of Temporary and permanent hardness of water.
3. Iodometric Titration of $K_2Cr_2O_7$ v/s $Na_2S_2O_3$ to determine the percentage purity of $K_2Cr_2O_7$ sample.
4. Preparation of Stanard Potassium Dichromate and Estimation of Copper by iodometry.
5. Determine the amount of Oxalic acid and Sulphuric acid in 1 liter solution by using given standard Sodium Hydroxide and Potassium Permanganate solution
7. Determination of Dissolved Oxygen (DO) content by Winkler’s method.
8. Preparation of Urea formaldehyde resin.
Exercise 1. Open and Run a VI  
Objective: Open, run, and explore the components of a VI.  
Open the Temperature System Demo VI from the tutorial_1 directory.

Exercise 2. Use of LabVIEW help utilities  
Objective: Become familiar with the context help and the LabVIEW help  
Open the Temperature System Demo VI from the tutorial_1 directory if it is not already open from Exercise 1.

Exercise 3. Create a VI  
Objective: Build a simple VI that converts a Celsius temperature reading to Fahrenheit.

Exercise 4. Document a VI  
Objective: Document a VI that you have created.

Exercise 5. Navigation and editing  
Objective: To learn LabVIEW editing techniques.

Exercise 6. Debug a VI  
Objective: To use the probe tool and the probe window and to examine data flow in the block diagram using execution highlighting.

LAB - II

Converting a VI into a sub VI (Exercise)  
Use of sub-VI (demo)  
Debug a VI (Demo)  
Debug Main (Exercise)  
Mechanical action of Boolean (Demo)  
While Loop & Charts (exercise)  
While Counter (Exercise)  
Moving averages (Exercise)  
Shift Register (Exercise)  
Die Roller (Exercise)
LAB - III

Case structure (Demo)
Calculator
SEQUENCE STRUCTURE
Building arrays with loops (Demo)
Building arrays with loops (Exercise)
Build array function (demo)
Building Tables (demo)
Replace array elements
Sort array values
Temperature Analysis

LAB - IV

Case structure (Demo)
Calculator
SEQUENCE STRUCTURE
CLUSTER ERROR. FIND AND RECTIFY?
BUTTON SELECTION (Demo)
BUTTON SELECTION with Shift Register (Demo)
LOCALS FOR PARALLEL LOOP CONTROL
LOCAL FOR RESET
LOCALS FOR CONTROL
Global Variables (Demo)
Function Generator (demo)
Noisy Signal (Demo)
Noisy Signal Analyzer (Demo)
Noisy Signal Analyzer with Filter (Demo)

LAB - V

Modeling and simulation of Physical Systems
UNIT - I

MASS MOMENT OF INERTIA: Moment of inertia of a rigid body – Moment of inertia of lamina- slender bar, rectangular plate, Circular plate, circular ring, Moment of inertia of 3D bodies- cone, solid cylinder, solid sphere. Moment of Inertia of composite bodies.

UNIT - II

KINEMATICS: Introduction, displacement, velocity and acceleration. Motion with Uniform and Variable acceleration. Angular displacement, Angular velocity and Angular acceleration. Equations of Motion along a circular path.

UNIT - III

PROJECTILES: Introduction, Basic Definitions, Projectile equations, Horizontal projection, Inclined Projection, Projectile on Horizontal plane and Inclined plane.

UNIT - IV


UNIT - V


TEXT BOOK

Engineering Mechanics / Fedinand . L. Singer / Harper – Collins

REFERENCES

4. Vector Mechanics for Engineers Static’s and Dynamics by Beer and Johnston, TATA Mc Graw Hill.
UNIT - I


UNIT - II


UNIT - III


**Entropy:** Introduction, Clasius Inequality, Property Diagrams, Tds-Relations, Maxwell Relation, Entropy Change for Ideal gases, Isentropic relations for ideal gases, Principle of Increase of Entropy-Closed and Control Volumes, Third Law of Thermodynamics.

UNIT - IV


**Pure Substance:** Introduction, Phases of Pure Substance, Phase Change Processes, Property Diagrams (T-v, P-v, P-T), P-v-T Surface, Property Tables.
UNIT - V

Refrigeration Cycles: Reversal Carnot Cycle, Bell-Coleman Cycle, Simple Vapor Compression Cycle.

TEXT BOOK


REFERENCES

3. Engineering Thermodynamics – P.K.Nag, TMH
UNIT - I

Introduction: General description of Fluid Mechanics, Classification of Fluids, Fluids and Continuum, Properties of Fluid – Pressure, Temperature, Density, Specific Weight, Specific Gravity, Viscosity, Compressibility, Surface Tension, Capillarity, Vapor Pressure

Fluid Statics: Pressure Force on a Fluid Element, Hydrostatic Pressure Distributions, Hydrostatic forces on submerged plane and curved surfaces, Manometers, Buoyancy and Stability

UNIT - II

Analysis of Fluid Flow: Eulerian and Lagrangian approaches, Velocity Field, Flow Patterns- Pathline, Streamline, Streakline, Timeline, Stream Tube


UNIT - III


Dimensional Analysis and Similarity: Introduction, Principle of Dimensional Homogeneity, Buckingham’s Pi Theorem, Dimensionless Groups, Similarity.

UNIT - IV

Hydraulic Turbines: Introduction, Classification of turbines- impulse and reaction turbines, Pelton Turbine, Francis Turbine and Kaplan Turbine-working principle, Work Done and Efficiency, Draft tube

UNIT V

**Reciprocating Pumps:** Classification, Working Principle, Co-efficient of Discharge and Slip, Indicator Diagram

**Centrifugal Pumps:** Classification, Working Principle, Work done, Head and Efficiencies, Losses, Specific Speed, Pumps in Series and Parallel, Performance Characteristics

**TEXT BOOK**

Fluid Mechanics, White F.M. Tata McGraw-Hill

**REFERENCES**

2. Introduction of Fluid Mechanics, Fox, R.W., and Mcdonald, A.J
<table>
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UNIT - I

SIMPLE STRESSES AND STRAINS: Stresses and strain due to axial force. Hooke’s law, factor of safety, stepped bars – uniformly varying sections - stresses in composite bars due to axial force and temperature - strain energy due to axial force, stresses due to sudden loads and impact. Lateral strain: Poisson’s ratio - change in volume – shear stress - shear strain - relationship between elastic constants

UNIT - II

SHEAR FORCE AND BENDING MOMENT: Relationship between loading - shear force and bending moment - shear force and bending moment diagrams for cantilever, simply supported and overhanging beams subjected to concentrated loads and uniformly distributed loads only - maximum bending moment and point of contra flexure.

UNIT - III

STRESSES IN BEAMS: Theory of simple bending: assumptions - derivation of the equation M/I = E/R = f/y – section modulus - calculation of normal stresses due to flexure application.

TORSION: Theory of torsion and assumptions - derivation of the equation T/J = Cθ/L = q/r, polar modulus, power transmitted by a shaft, stresses in solid and hollow circular shafts

UNIT - IV

ANALYSIS OF STRESSES IN TWO DIMENSIONS: State of stress at a point, normal and tangential stresses on inclined planes - principal stresses and their planes - plane of maximum shear - Mohr’s circle of stresses.

SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beam cross sections like Rectangular, Circular, Triangular, I and T Sections.

UNIT - V


THIN, THICK AND SPHERICAL SHELLS: Hoop and longitudinal stress- thin and thick cylinders- spherical shells-changes in dimensions and volume.
TEXT BOOK

S.Ramamrutham, Strength of Materials, Dhanpat Rai & Sons

REFERENCES

4. R.Subramanian, Strength of Materials, Oxford University Press
UNIT - I

History: Early planes, Components of Airplane and their functions, Types Flight Vehicles, Classifications, Standard Atmosphere, Altitude, Hydrostatic Equation, Geopotential and Geometric Altitudes

UNIT - II


UNIT - III


UNIT - IV


UNIT - V

Space Flight: Introduction, Orbit Equation, Basic Aspects of Space Vehicle Trajectories, Kepler's Laws, Earth and Planetary Entry, Space Explorations- space vehicles and its types, reusable space vehicles, space shuttle, satellites, Types of satellites and their functions

TEXT BOOK

Introduction to Flight, John D. Anderson, Jr., McGrawHill

REFERENCES

1. Aerodynamics for Engineering Students, Houghton and Carpenter
UNIT - I

**Electrical Circuits:** Basic definitions, Types of elements, Ohm’s Law, Resistive networks, Kirchhoff’s Laws, Inductive networks, capacitive networks, Series, Parallel circuits and Star-delta and delta-star transformations

UNIT - II

**Transformers:** Principle of operation of single phase transformers, Ideal transformer, Practical transformer, phasor diagram.– emf equation – losses – efficiency and regulation.

UNIT - III


UNIT - I V

**Diode and Transistors:** P-n junction diode, symbol, V-I Characteristics, DiodeApplications, Rectifiers – Half wave, Full wave and Bridge rectifiers (simple Problems).PNP and NPN Junction transistor, Transistor as an amplifier, SCR characteristics and applications.

UNIT - V

**Electrical and Electronics Measuring Instruments.**

**Electrical Instruments:** Basic Principle of indicating instruments – permanent magnet moving coil and moving iron instruments.

**Electronic Instruments:** Principles of CRT (Cathode Ray Tube), Deflection, Sensitivity, Electrostatic and Magnetic deflection, Applications of CRO - Voltage, Current and frequency measurements.

**TEXT BOOK**

Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin/Pearson.

**REFERENCES**

3. Electrical Technology by JB GUPTA
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Any of the 5 Experiments are required to be conducted from each section

**FLUID MECHANICS**

1. Calibration of Orifice and Mouth Piece  
2. Calibration of Venturimeter and Orifice meter  
3. Verification of Bernollious Theorem  
4. Determination of friction factor for a given pipe line  
5. Determination of loss of head due to sudden contraction in a pipeline  
6. Impact of jets on Vanes.  
7. Performance Test on Pelton Wheel.  
8. Performance Test on Kaplan Turbine.  
10. Performance Test on Reciprocating Pump.

**STRENGTH OF MATERIALS**

1. Tension test on mild steel rod.  
2. Deflection test on Cantilever beam.  
3. Deflection test on Simply supported beam  
4. Compression test on helical spring.  
5. Torsion test on mild steel rod.  
6. Impact test on metal specimen.  
7. Hardness test on metals.  
8. Double shear test on metals
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Any of the 10 Experiments are required to be conducted

**LIST OF EXPERIMENTS**

1. Brake Test on 3-Ph Squirrel Cage Induction Motor
2. Regulation of 3-Ph Alternator by Synchronous Impedance Method
3. O.C &S.C tests on 1-phase transformer
4. Separation of core losses of 1-phase transformer
5. Load Test on 1-phase Transformer
6. Mesh Analysis
7. Nodal Analysis
8. RL & RC Series circuits
9. Diode characteristics
10. Transistor characteristics

**ADDITIONAL EXPERIMENTS**

11. CE Amplifier
12. Half wave & Full wave rectifiers
IV-SEMESTER
UNIT - I

**Potential Flow:** Introduction, Laplace’s Equation, Basic flows – Uniform parallel flow, Source, Sink, Simple Vortex, Source-Sink Pair, Doublet, Combination of Simple flows-Flow past a half body, Rankine Ovel, Flow past a circular cylinder without circulation and with circulation, Circulation and lift (Kutta-Joukowsky Theorem)

UNIT - II

**Conformal Mapping:** Introduction, Basic Principles, Length Ratios between the Corresponding Elements in the Physical and Transformed Planes, Velocity Ratios between the Corresponding Elements in the Physical and Transformed Planes, Methods for Performing Transformation, Kutta-Joukowski Transformation, Transformation of Circle to Straight Line, Transformation of Circle to Ellipse, Transformation of Circle to Symmetrical Aerofoil, Transformation of Circle to Cambered Aerofoil

UNIT - III


UNIT - IV

**Finite Wing Theory:** Introduction, Starting Vortex, Trailing Vortex- Horse shoe vortex, Vortex filament, Biot-Savart law and Helmholtz Theorms, Vortex line, down wash, induced drag, Prandtl’s Lifting Line Theory-Elliptic Lift Distribution, General Lift Distribution

UNIT - V

**Boundary Layer:** Introduction, Boundary layer development, Boundary layer thickness, Displacement thickness, Momentum thickness, Energy thickness, Types of boundary layer, Momentum Integral Estimates- Karman Analysis of the Flat plate, Navier-Stokes Equations, Boundary layer Equaltions-2D Flow, Boundary layer growth on a flat plate-Blasius Solution, Boundary Layer with Pressure Gradient
TEXT BOOK


REFERENCES

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UNIT - I

**Failure Theory:** Maximum Stress theory – Maximum Strain theory – Maximum Shear Stress Theory – Distortion energy theory – Maximum Strain energy theory, Concept of principal planes - Principal stresses- Determination of normal and tangential stresses-Graphical method- Mohr’s circle.

UNIT - II

**Statically Determinate Structures:** Analysis of plane truss- Method of joints- Method of sections- Plane frames-Composite beam.

UNIT - III

**Statically Indeterminate Structures:** Propped cantilever- Fixed-Fixed beams-Clapeyron's three moment equation – Moment distribution Method.

UNIT - IV

**Energy Methods:** Strain Energy due to axial, bending and Torsional loads – Castiglialno’s theorems-Maxwell's Reciprocal theorem, Unit load method - application to beams and trusses.

UNIT - V

**Columns:** Introduction- Axially loaded compression members-Crushing load-Buckling load-Euler’s theory-Effective length of column- limitations-Euler’s formula-Rankine’s formula –Column with initial curvature- Columns subjected to eccentric loading – Euler's method- Rankine’s method.

**TEXT BOOKS:**


**REFERENCES**

UNIT - I


UNIT - II

STEAM NOZZLES:  Types of steam nozzles-steam flow through a nozzle-Flow through actual nozzles-Supersaturated expansion of steam.


UNIT - III


UNIT - IV


UNIT - V

Refrigeration:Introduction-Refrigerators-Unit of Refrigeration-Types of Refrigeration Systems-Air Refrigeration System-Simple air cooling System-Simple air evaporative cooling system-Boot-Strap air evaporative cooling system-Reduced ambient air cooling system-Regenerative air cooling system.

Air Conditioning:  Introduction-Psychrometry -Types of air conditioning systems - Summer air conditioning-Winter air-conditioning-Year round air-conditioning (Qualitative treatment).

TEXT BOOK

Applied Thermodynamics, T.D Eastop and A. McConkey, Pearson Education
REFERENCES

2. Thermal Engineering, Mahesh Rathore, TMH
3. Basic Engineering Thermodynamics, Roy Choudhury
4. Power Plant Engineering, P.K Nag, TMH
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**UNIT - I**

Introduction to Manufacturing: Historical perspective; Importance of manufacturing; Classification of manufacturing processes; Engineering materials.

**Casting:** Steps involved in making a casting - Advantages of castings and its applications – Pattern making - Types of patterns - Materials used for patterns - pattern allowances and their constructions - principles of Gating, Gating ratio, types of raisers, casting defects

**Special casting processes:** 1. Centrifugal 2. Die 3. Investment 4. Continuous

**UNIT - II**

Welding and other joining processes: Classification of welding process - Types of weld - welded joints and their characteristics - Principle and applications - Gas welding - Arc welding - welding defects; Inert gas welding - Tig and Mig welding; Friction welding, Induction welding, Soldering and Brazing.

**UNIT - III**


**Extrusion of metals:** Basic extrusion process and its characteristics, Hot extrusion and Cold extrusion – Forward extrusion and Backward extrusion, Impact extrusion, Hydrostatic extrusion.

**Sheet metal operations:** Stamping, Forming and other cold working processes, Blanking and piercing, Bending and forming

**UNIT - IV**

Machining Processes: Mechanism of chip formation; Tool geometry; cutting tool & tool wear - cutting materials; tool life & machinability - cutting fluids; Introduction to Lathe - working Principle of lathe and operations

**UNIT - V**

Machining operations: Shaping, planning, milling, drilling, grinding processes, Finishing processes Introduction to unconventional machining processes: EDM, ECM, UCM, CHM and LBB
TEXT BOOK

1. Manufacturing science-Amitabha Ghosh, Ashok kumar Malik
2. Manufacturing processes: Serope Kalpakjain, Steven R. Schmid

REFERENCES

1. Manufacturing Technology / P.N. Rao/TMH
2. Production Technology / R.K. Jain
4. Production Technology /Sarma P C /
5. Workshop Technology-B.S. Raghuvamsi-Vol.I /PHI
UNIT - I


UNIT - II


UNIT - III

Environmental Pollution: Definition, Types, 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 - IV

Social Issues and the Environment: From Unsustainable to Sustainable development

UNIT - V


TEXT BOOKS

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

REFERENCES

Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.
UNIT - I

**Probability**: Sample space and events – Probability – The axioms of probability – Some Elementary theorems - Conditional probability – Baye’s theorem.

UNIT - II


UNIT - III

Population and samples. Sampling distribution of mean (with known and unknown variance), proportion, variances. - Sampling distribution of sums and differences. Point and interval estimators for mean, variance and proportions. Statistical Hypothesis – Errors of Type I and Type II errors and calculation. One tail and two-tailed tests. Testing of hypothesis concerning means, proportions and their differences using Z-test.

UNIT - IV

Tests of hypothesis using Student’s t-test, F-test and $\chi^2$ test. Applications of decision making using the above tests.

UNIT - V

Statistical Quality Control methods – Methods for preparing control charts – Problems using x-bar, p, R charts and attribute charts – Simple Correlation and Regression. Queuing Theory: Pure Birth and Death Process M/M/1 Model and Simple Problems related to the evaluation of waiting time, length of the queue etc.

**TEXT BOOKS**

1. Probability and Statistics for Engineers, Miller ,John E. Freund, PHI
2. Probability and Statistics, Gupta & Kapoor
3. Probability, Statistics and Queuing theory applications for Comp. Sciences, 2 /e, Trivedi, John Wiley.
Any of the 10 Experiments are required to be conducted

1. I.C. Engines Valve & Port Timing Diagrams
2. Performance Test on Variable Compression Ratio single cylinder 4-Stroke petrol Engine By using Eddy Current Dynamometer
3. Performance Test on single cylinder 4-Stroke Diesel Engine by using Mechanical Dynamometer
4. Performance test on twin cylinder 4-stroke diesel engine.
5. Performance Test on single cylinder 2-Stroke Petrol Engine.
6. Evaluation of Engine friction power by conducting Morse test on Multi cylinder 4-Stroke Petrol Engine.
7. Evaluation of Engine friction by conducting Retardation test on 4-stroke Diesel Engine.
11. Performance Test on Reciprocating Air – Compressor.
12. Performance Test on Vapour Compression Refrigeration Unit.
13. Performance Test on Air Conditioning Unit.
15. Viscosity of lubricants by using Redwood/ Say bolt viscometer Apparatus
16. Flash and Fire Point of fuels by using pesky Martin Apparatus
17. Carbon Residue test
I. METAL CASTING LAB

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise - for strengths, and permeability – 1
3. Moulding Melting and Casting - 1 Exercise

II. MACHINE TOOLS LAB

1. Lathe Operations
2. Special Machines: Drilling, Shaping, Milling Grinding (Surface Grinding), Slotting
3. Preparation of Single Point Cutting Tool

III WELDING LAB

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1 Exercise
3. TIG Welding - 1 Exercise

IV MECHANICAL PRESS WORKING

3. Bending and other operations

V PROCESSING OF PLASTICS

1. Injection Moulding
V-SEMESTER
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**UNIT - I**


**UNIT - II**

**Subsonic and supersonic inlets:** Introduction, Subsonic Inlets, internal flows, external flow, Supersonic inlets – Starting problem on supersonic inlets, Shock-Swallowing, Flow stability problem

**UNIT - III**

**Compressors:** Principle of operation of centrifugal compressor – Work done and pressure rise – Velocity diagrams – Diffuser vane design considerations – Concept of Prewhirl, Stall and Surge, Elementary theory of axial flow compressor – Velocity triangles – degree of reaction – Three dimensional Analysis– Air angle distributions for free vortex and constant reaction designs – Compressor blade design – Centrifugal and Axial compressor performance characteristics.

**UNIT - IV**

**Combustion Chambers**

**UNIT - V**


**TEXT BOOK**

REFERENCES

UNIT - I


UNIT - II

Steady One-dimensional Flow: Introduction, Fundamental Equations, Discharge from a reservoir, Critical values, Stream tube area-velocity relation, Types of nozzles, Applications of nozzles, Area-Mach number relation, Isentropic flow through nozzles, Diffusers, Dynamics head measurement in compressible flow, Compressibility correction to dynamics pressure, Pressure coefficient

UNIT - III


UNIT - IV


UNIT - V

Compressible Flow over Wings: Introduction, Crocco’s Therorem, Potential Equation for Compressible flow, Linearization of Potential Equation, Prandtl-Glauert Rule, Critical Mach Number, Drag-Divergence Mach Number, Area-Rule, Supercritical Aerofoil, Forward Swept and Swept Back Wings, Delta Wings

TEXT BOOK

REFERENCES

2. Elements of Gas Dynamics, H.W. Lipmann and A. Roshko
UNIT - I

AIRPLANE CONTROL SYSTEMS
Conventional Systems – Power assisted and fully powered flight controls – Power actuated systems – Engine control systems – Push pull rod system – operating principles – Modern control systems – Digital fly by wire systems – Auto pilot system, Active Control Technology

UNIT - II

AIRCRAFT SYSTEMS
Hydraulic systems - Study of typical workable system - components – Pneumatic systems - Advantages - Working principles - Typical Air pressure system – Brake system - Typical Pneumatic power system - Components, Landing Gear systems - Classification

UNIT - III

ENGINE SYSTEMS
Fuel systems for Piston and jet engines, - Components of multi engines. Lubricating systems for piston and jet engines - Starting and Ignition systems - Typical examples for piston and jet engines

UNIT - IV

AUXILIARY SYSTEM

UNIT - V

AIRCRAFT INSTRUMENTS
TEXT BOOKS


REFERENCES

UNIT - I


One-Dimensional Steady State Conduction: Heat flow through plane wall and cylinder with constant thermal conductivity- Electrical analogy-Thermal resistance- Overall heat transfer coefficient-Heat flow through Composite Wall and Cylinder - Critical radius of insulation for Cylinder.

UNIT - II

One Dimensional Steady State Conduction: Heat flow through plane wall and cylinder with Variable Thermal conductivity - Uniform internal heat generation in Slabs-Extended Surfaces- Analysis of Long Fin and Short fin with insulated tip - Fin efficiency and Effectiveness .

One Dimensional Transient Heat Conduction: Systems with negligible internal resistance-Lumped Heat analysis–Significance of Biot and Fourier Numbers-Plane wall with finite surface and internal resistance using Heisler Chart.

UNIT - III

Convective Heat Transfer: Introduction-Types of Convection- Convective heat transfer coefficient- Dimensional analysis -Buckingham Pi Theorem applied to Forced convection--Significance of Non Dimensional numbers-The boundary layer concept-The velocity and Thermal boundary layers.


Natural Convection: Development of Hydrodynamic and thermal boundary layer along a Vertical plate- Empirical correlations for Vertical plate , Vertical Cylinder, Horizontal Plate and Horizontal Cylinder.
UNIT - IV


UNIT - V

NOTE: Heat and Mass Transfer Data Book by C.P. Kothandaraman and Subramanian- New Age Publications is to be allowed in Examination.

TEXT BOOK


REFERENCES

3. Heat Transfer – C. J. Cengel - TMH
4. Heat transfer - J.P.Holman, McGrawHill
UNIT - I

Fundamentals of CAD: Introduction – The design process – The application of computers for design- Creating the manufacturing data base – Benefits of CAD.

UNIT - II

Geometric Modeling: Representation of curves: Introduction, wireframe models, wireframe entities, curve representation, parametric representation of analytical curves, parametric representation of Bezier and B-Spline curves
Representation of surfaces: Introduction, surface models surface entities, parametric representation of analytical surfaces- parametric representation of Bezier and B-Spline surfaces
Representation of solids: Introduction, solid models, solid entities, Solid representation, Fundamentals of solid modeling, Boundary representation, CSG representation.

UNIT - III


UNIT - IV


UNIT - V

Computer Aided Quality Control: Introduction – the computers in Q C – Contact Inspection methods – Non contact inspection methods: optical, non optical – Computer Aided Testing-Integration of CAQC with CAD/CAM.
TEXT BOOK


REFERENCES

1. Mikell P. Groover and Emory W. Zimmers, CAD/CAM- prentice Hall of India private LTD. New Delhi
3. P. Radhakrishnan, S. Subramanyan & V. Raju, CAD/CAM/CIM, New Age International Publishers
UNIT - I


UNIT - II


UNIT - III

Steels: Classification of steels, structure and properties of plain carbon steels-low carbon steel, medium carbon steel and high carbon steel.

Cast Irons: Structure and properties of white cast iron, malleable cast iron, grey cast iron, spheroidal graphite cast iron.


UNIT - IV

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth. Comparison of properties of cold and hot worked parts.


UNIT - V

Ceramic Materials: Properties and applications of ceramic materials, glasses, cermets, and abrasive materials

TEXT BOOK

Introduction to Physical Metallurgy / Sidney H. Avener-Tata McGraw-Hill

REFERENCES

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Any of the 10 Experiments are required to be conducted

1. Calibration of a Subsonic Wind Tunnel
2. Determination of Lift for the given aerofoil section
3. Pressure Distribution over a smooth circular cylinder
4. Pressure Distribution over a rough circular cylinder
5. Pressure Distribution over a symmetrical aerofoil
6. Pressure Distribution over a cambered aerofoil
7. Flow visualization study over objects in water flow channel
8. Generation of potential flow pattern over objects using Hele-Shaw Apparatus
9. Flow visualization in smoke tunnel
10. Calibration the Open Jet Facility
11. Design and Calibration of Convergent- Divergent Nozzle
12. Estimation of Mach Number of Convergent and Convergent- Divergent Nozzle
13. Studies on overexpanded, correctly expanded and underexpanded flows
14. Yaw effect on Pitot probe and Pitot-Static probe in incompressible flows
15. Yaw effect on Pitot probe and Pitot-Static probe in compressible flows
16. Studies on Suddenly Expanded Flows
17. Subsonic Jet Characteristics
18. Supersonic Jet Characteristics
19. Supersonic Flow Visualization using Shadowgraph Technique
Any of the 10 Experiments are required to be conducted

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 Boltzmann Apparatus.
15. Study of Two – Phase flow.
UNIT - I

STEADY FLIGHT PERFORMANCE: Equations of motion of a airplane in flight, Thrust to Weight Ratio, Wing Loading, Drag polar, and Lift to Drag Ratio, Thrust Required for level and Unaccelerated Flight, Thrust Available and maximum Velocity, Power Required for level and Unaccelerated Flight, Power Available and Maximum Velocity, Altitude Effects, Drag Divergence

UNIT - II

MANOEUVERING FLIGHT PERFORMANCE: Rate of Climb, Time to Climb, Range, Endurance, Gliding flight, Absolute and Service Ceilings, Take-off and landing Performance, Turning Flight and V-n diagram, Accelerated Flight of Climb (Energy Method),

UNIT - III


UNIT - IV

LATERAL AND DIRECTIONAL STATIC STABILITY: Dihedral effect - Lateral control - Coupling between rolling and yawing moments - Adverse yaw effects - Aileron reversal - Static directional stability - Weather cocking effect - Rudder requirements - One engine inoperative condition - Rudder lock, Power Effects

UNIT - V

DYNAMIC STABILITY AND CONTROL: Introduction to dynamic longitudinal stability: - Modes of stability, Routh's Discriminant, effect of freeing the stick, Phigoid Motion, Brief description of lateral and directional dynamic stability- Spiral, divergence, Dutch roll, auto rotation and spin

TEXT BOOKS

REFERENCES

UNIT - I

UNSYMMETRICAL BENDING: General, Principal axis and neutral axis method- 
bending stresses in beams of symmetric sections with skew loads- bending stresses 
in beams of unsymmetrical sections.

UNIT - II

SHEAR FLOW IN OPEN SECTIONS: Thin walled beams, Concept of shear flow, 
shear centre, Elastic axis. With one axis of symmetry, with wall effective and 
ineffective in bending, unsymmetrical beam sections.

UNIT - III

SHEAR FLOW IN CLOSED SECTIONS: Bredt – Batho formula, Single and multi – 
cell structures.- Shear flow in single & multicell structures under torsion. Shear flow 
in single and multicell under bending with walls effective and ineffective.

UNIT - IV

BUCKLING OF PLATES: Rectangular sheets under compression, local buckling 
stress of thin walled section- Crippling stresses by Needham’s and Gerard’s 
methods, Thin walled column strength sheet stiffener panels-Effective width.

UNIT - V

STRESS ANALYSIS IN WING AND FUSELAGE: Shear resistant web beams- 
Tension field web beams(Wagner’s) – Shear and bending moment distribution for 
cantilever and semi-cantilever types of beams-loads on aircraft – lift distribution-V-n 
diagram-Gust loads

TEXT BOOKS


REFERENCES

   set company, USA, 1985.
UNIT - I


UNIT - II

**ROCKET PROPULSION:** Operating principle, Effective Exhaust Velocity and Specific impulse, Rocket Propulsion Requirements, Equations of Motion for an Accelerating Rocket, Multistage Rocket

UNIT - III

**LIQUID PROPELLANT ROCKET:** Introduction, Liquid Propellants, Propellant Feed Systems-Gas pressure feed systems, Types of Fuels and Oxidizers, Combustion Process, Combustion Instability, Propellant Tanks, Tank pressurization, Maneuvering, Orbit Adjustment, Attitude control

UNIT - IV

**SOLID PROPELLANT ROCKET:** Solid propellant rockets, Combustion process, Propellant Burning Rate, Selection criteria of solid propellants, Propellant grain and its configuration, Hybrid Rockets, Propellant Grain Stress and Strain, Attitude Control Rocket Motor

UNIT - V

**ADVANCED PROPULSION TECHNIQUES:** Electric rocket propulsion-Electrothermal, Non-Electrothermal, Electrostatic Electro Magnetic Thrusters, Ion propulsion techniques, Arcjet, Pulsed Magnetoplasma Accelerators, Solar sail, Nozzleless propulsion, Energy Spike, MHD Propulsion, Nuclear rockets

TEXT BOOK

REFERENCES

1. Elements of propulsion: Gas Turbines and Rockets, J.D Mattingly, AIAA Educational Series
UNIT - I


UNIT - II

Analysis of Beams: Element stiffness matrix for two nodes, two degrees of freedom per node beam element Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions.

UNIT - III

Finite element modeling of axisymmetric solids subjected to axisymmetric loading with triangular elements. Two dimensional four noded isoparametric elements and numerical integration-Gauss quadrature

UNIT - IV

One dimensional steady state heat transfer analysis of a fin-Element conductivity matrix-Convection matrix-Heat rate vector. Two dimensional analysis of thin plate with triangular elements-Element conductivity matrix-Convection matrix-Heat rate vector

UNIT - V

Dynamic Analysis: Formulation of finite element model-element matrices-evaluation of eigen values and eigen vectors for a stepped bar and a beam.

TEXT BOOK

Introduction to Finite Elements in Engineering / Chandrupatla, Ashok and Belegundu / Prentice – Hall

REFERENCES

2. The Finite Element Methods in Engineering / SS Rao / Pergamon
4. Finite Element Analysis/ C.S.Krishna Murthy
<table>
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<th>T325 THEOREY OF MACHINES</th>
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**UNIT - I**

**MECHANISMS:** Machine- Structure – Kinematic link, pair and chain – Grueblers criteria – Constrained motion – Degrees of freedom – Four bar mechanism - Sinle and Double slider crank chains – Inversions – Applications – Kinematic analysis of simple mechanisms – Determination of velocity and acceleration of four bar and single slider crank mechanism only.

**UNIT - II**

**FRICITION:** Friction in screw and nut – Pivot and collar – Thrust bearing – Plate and disc clutches – Belt (flat and V) and rope drives. Ratio of tensions – Effect of centrifugal and initial tension – Condition for maximum power transmission – Open and crossed belt drive.

**UNIT - III**

**GEARING AND CAMS:** Gear profile and geometry – Nomenclature of spur and helical gears only– Gear trains - Simple, compound gear trains and epicyclic gear trains - Determination of speed and torque Cams – Types of cams – Design of profiles – Knife edged, flat faced and roller ended followers with and without offsets for various types of follower motions

**UNIT - IV**

**PRECISION:** Effect of Precission on Stability of moving vehicles such as motorcar motorcycle Aero planes- Static and Dynamic forces generated due to in Precission in moving mechanisms including Gyroscopic motions..

**UNIT-V**

**BALANCING:** Static and dynamic balancing – Single and several masses in different planes –Balancing of reciprocating masses- primary balancing and concepts of secondary balancing – Single and multi cylinder engines (Inline) – Balancing of radial V engine – direct and reverse crank method.

**TEXT BOOKS**

REFERENCES

T350
APPLIED GAS DYNAMICS

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UNIT - I


UNIT - II


UNIT - III


UNIT - IV

RAREFIED GAS DYNAMICS: Introduction, Molecular Model of Gases, Mean Free path of Molecules, Knudsen Number, Flow Regimes, Boltzmann’s Relation, Basic Concepts of Kinetic Theory, Slip Flow, Transition and Free Molecular Flow

UNIT - V


REFERENCES

6. Rarefied Gas Dynamics, Shen, Ching, Springer
UNIT - I


UNIT - II


UNIT - III


UNIT - IV

INTERPLANETARY TRAJECTORIES: Two Dimensional Interplanetary trajectories – Fast Interplanetary Trajectories – Three Dimensional Interplanetary Trajectories – Launch if interplanetary Spacecraft – Trajectory about the Target Planet.

UNIT - V


REFERENCES

UNIT - I

Elasticity: Two dimensional stress analysis - Plane stress - Plane strain - Equations of compatibility - Stress function - Boundary conditions. 
Problem in rectangular coordinates - Solution by polynomials - Saint Venent's principles - Determination of displacement - Simple beam problems.

UNIT - II

Problems in polar coordinates - General equations in polar coordinates - Stress distribution symmetrical about axis - Strain components in polar coordinates - Simple and symmetric problems.

UNIT - III

Analysis of stress and strain in three dimensions - Principle stresses - Homogeneous deformations - Strain spherical and deviatoric stress - Hydrostatic strain.

UNIT - IV

General theorems: Differential equations of equilibrium and compatibility - Displacement - Uniqueness of solution - Reciprocal theorem.

UNIT - V

Bending of prismatic bars - Stress function - Bending of cantilever beam - Beam of rectangular cross-section - Beams of circular cross-section.

REFERENCES

1. Timeshenko & Goodier, Theory of Elasticity - McGraw Hill
2. Theory of Elasticity by A.I.Lurie, Springer
3. Experimental stress analysis by Dally and Riley, Mc Graw-Hill
5. Theory of Elasticity by A.Meceri, Springer
UNIT - I

FUNDAMENTALS OF HYPersonic Aerodynamics:
Introduction to hypersonic aerodynamics-differences between hypersonic aerodynamics and supersonic aerodynamics-concept of thin shock layers-hypersonic flight paths-hypersonic similarity parameters-shock wave and expansion wave relations of in viscid hypersonic flows

UNIT - II

INVISCID HYPersonic FLOWS: Local surface inclination methods-Newtonian theory-modified Newtonian law-tangent wedge and tangent cone and shock expansion methods-approximate theory-thin shock layer theory.

UNIT - III

VISCOUS HYPersonic FLOW: Boundary layer equation for hypersonic flow-hypersonic boundary layers-self similar and non self similar boundary layers-solution methods for non self similar boundary layers, Aerodynamic heating

UNIT - IV

VISCOUS INTERACTIONS IN HYPersonic FLOWS: Introduction to the concept of viscous interaction in hypersonic flows-strong and weak viscous interactions-hypersonic viscous interaction similarity parameter-introduction to shock wave boundary layer interactions

UNIT - V

HIGH TEMPERATURE GAS DYNAMICS: Nature of high temperature flows-chemical effects in air-real and perfect gases-Gibb’s free energy and entropy-chemically reacting mixtures-recombination and dissociation.

REFERENCES
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**UNIT - I**


**UNIT - II**

Applications and extensions of LP: Transportation problem, Assignment problem, Karmarkar's method, Quadratic programming and Engineering Applications.

**UNIT - III**


**UNIT - IV**


**UNIT - V**

Dynamic Programming & Non-traditional Optimization: Principle of optimality, computational procedure, applications from engineering, Evolutionary Programming Techniques – Genetic Algorithm (GA), the three parameters of GA, computational procedure for both binary and analogue coded inputs. Introduction to Particle swarm Optimization. Numerical examples.
REFERENCES

7. Swarm Intelligence, Kennedy, J. and Eberhart, R.C., 2001, Morgan Kaufmann.
Any of the 10 Experiments are required to be conducted

1. To determine gyroscopic couple on Motorized Gyroscope
2. To find the stability and sensitivity of Watt and Porter governor
3. Balancing of rotating and reciprocating masses
4. Determination of critical speed of shaft with concentration loads
5. Determination of Poisson Ratio
6. Shear Failure of Bolted and Riveted Joints
7. To find the transverse vibrations of free-free and cantilever beam
8. Forced Vibration of Beams
9. To find the coefficient of friction between belt and pulley
10. Combined Bending and Torsion of a Hollow Circular Tube
11. Bending Modulus of a Sandwich Beam
12. Unsymmetrical Bending of a Cantilever Beam
13. Determination of Material Fringe Constant of a Photo Elastic Model
14. Determination of Shear Center of a Channel Section
15. Wagner beam-Tension Field beam
16. Buckling Load of Slender Eccentric Columns
17. Determination of Material Properties of a Composite Laminate
18. Construction of South – well’s plot.
19. Verification of Maxwell’s Reciprocal theorem
20. Verification of Superposition Theorem
Any of the 10 Experiments are required to be conducted

1. Study of free jet
2. Study of wall jet
3. Study of free convective heat transfer over a flat plate
4. Study of forced convective heat transfer over a flat plate
5. Study of an aircraft jet engine - assembly of sub systems
6. Cascade testing of a model of axial compressor blade row
7. Study of an aircraft piston engine. (Includes study of assembly of sub systems, various components, their functions and operating principles)
8. Study of an aircraft jet engine - various components, their functions and operating principles
9. Study of Properties of aviation fuel
10. Flame stabilization Studies using Conical Flame Holders
11. Burnrate measurements of Solid propellant
12. Study of performance of a propeller
13. Combustion performance studies in a jet engine combustion chamber
14. Study of Co-axial jet
15. Studies on cross-flow
16. Studies on Subsonic Inlets
17. Studies on Supersonic Inlets
18. Study of ramjet
VII-SEMESTER
UNIT - I


UNIT- II


UNIT- III

LAMINATED PLATES: Governing differential equation for a general laminate, angle ply and cross ply laminates. Failure criteria for composites.

UNIT- IV

SANDWICH CONSTRUCTIONS: Basic design concepts of sandwich construction - Materials used for sandwich construction - Failure modes of sandwich panels.

UNIT- V


TEXT BOOKS


REFERENCES

UNIT - I


UNIT - II

Damped free vibrations of single degree of freedom systems: Introduction – Different types of dampings – Free vibrations with viscous damping – Over damped, critically damped and under damped systems - Logarithmic decrement – Viscous dampers

UNIT - III

Forced vibrations of single degree of freedom systems: Introduction – Forced vibrations with constant harmonic excitation – Steady state vibrations – Forced vibration with rotating and reciprocating unbalance - Forced vibrations due to excitation of the support – Vibration isolation and transmissibility - Typical isolators and mount types – vibration measuring instruments

UNIT - IV

Two degrees of freedom systems: Introduction – Principal modes of vibrations – Other cases of simple two degrees of freedom systems – Two masses fixed on a tightly stretched string - Double pendulum – Torsional system – Undamped forced vibrations with harmonic excitation - Undamped dynamic vibration absorber

UNIT - V


TEXT BOOK

Mechanical vibrations/ G.K.Grover/ Nem chand & Bros.

REFERENCES
2. Mechanical vibrations/William W.Seti/ Schaum outline series
4. Mechanical Vibrations/S.S.Rao/Pearson Education
UNIT - I


UNIT - II

Strain Measurement: Strain - its relation to experimental determination - properties of strain Gauge systems - Electrical resistance strain gauges - strain gauge circuits - recording instruments - analysis of strain gauge data.

UNIT - III

Moire Methods: Mechanism of formation of Moire fringe - geometrical approach to Moire fringe analysis - displacement field approach to Moire fringe analysis - out of plane measurements experimental procedure.

UNIT - IV


UNIT - V

Birefringent Coatings: Coating stresses and strains - sensitivity - materials and applications - effect of thickness - stress separation.

TEXT BOOK

Experimental Stress Analysis, James Dalley, W.F.Riley, McGraw Hill

REFERENCES

1. Experimental Stress Analysis, Dove Adams, McGraw Hill
2. Strain Gauge Primer, Perry and Lissiener, McGraw Hill
3. Photomechanics, Durelli, Prentice Hall
UNIT - I

Need and Objective of Experimental Study: Introduction, Measurement Systems, Performance Terms

Wind Tunnels: Introduction, Classification, Low-speed Wind Tunnels, Power Losses in Wind Tunnel, Energy Ratio, High-speed Wind Tunnels, Instrumentation and Calibration of Wind Tunnels, Wind Tunnel Balance-Wire Balance, Strut-Type, Platform Type, Yoke Type, Strain-Gauge Balance, Balance Calibration

UNIT - II

Flow Visualization and Analog Methods: Introduction, Classification of Visualization Techniques, Smoke Tunnel, Interferometer, Schlieren and Shadowgraph, Hele-Shaw Apparatus, Electrolytic Tank, Hydraulic Analogy, Hydraulic Jumps

UNIT - III


UNIT - IV

Pressure Measurement Techniques: Introduction, Barometers, Manometers, Dial type pressure gauge, Pressure Transducers, Pitot, Static, and Pitot-Static Tube and Its characteristics, Flow direction measurement probes and Low Pressure Measurement Gauges

Temperature measurement: Introduction, Types of thermometers, Thermocouples, RTD, Thermisters, Pyrometers, Temperature measurement in fluid flows

UNIT - V

Data Acquisition: Introduction, Data Acquisition Principle, Generation of Signal, Signal Conditioning, Multiplexing, Data Conversion, Data Storage and Display, Data Processing, Digital Interfacing, Data Acquisition using Personal Computers

TEXT BOOK


REFERENCES

UNIT - I

**Introduction**: Computational Fluid Dynamics as a Research and Design Tool, Applications of Computational Fluid Dynamics

**Governing Equations of Fluid Dynamics**: Introduction, Control Volume, Substantial Derivative, Divergence of Velocity, Continuity Equation, Momentum Equation and Energy Equation, Conservation and Non-conservation forms

UNIT - II


UNIT - III

**Basics Aspects of Discretization**: Introduction, Introduction of Finite Differences, Difference Equations, Explicit and Implicit Approaches, Errors and Stability Analysis, Grid Generation

UNIT - IV

**Incompressible Fluid Flow**: Introduction, Implicit Crank-Nicholson Technique, Pressure Correction Method, Computation of Boundary Layer Flow

UNIT - V


**TEXT BOOK**


**REFERENCES**

UNIT - I

ELEMENTS OF HELICOPTER AERODYNAMICS: Configurations based on torque reaction-Jet rotors and compound helicopters- Methods of control – Collective and cyclic pitch changes - Lead - Lag and flapping hinges.

UNIT - II

IDEAL ROTOR THEORY: Hovering performance - Momentum and simple blade element theories - Figure of merit - Profile and induced power estimation - Constant chord and ideal twist rotors.

UNIT - III

POWER ESTIMATES: Induced, profile and parasite power requirements in forward flight- performance curves with effects of altitude-Preliminary ideas on helicopter stability

UNIT - IV

LIFT, PROPULSION AND CONTROL OF V/STOL AIRCRAFT: Various configuration - Properller, rotor, ducted fan and jet lift - Tilt wing and vectored thrust - Performance of VTOL and STOL aircraft in hover, transition and forward motion.

UNIT - V

GROUND EFFECT MACHINES: Types - Hover hieght, lift augmentation and power calculations for plenum chamber and peripheral jet machine - Drag of hovercraft on land and water. Applications of hovercraft.

REFERENCES

T326
THEORY OF PLATES AND SHELLS

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UNIT - I


UNIT - II

PLATES OF VARIOUS SHAPES: Navier’s Solution and energy method-Rectangular and circular plates with various end conditions – Levy’s Method of Solution for Rectangular Plates under Different Boundary Conditions.

UNIT - III

EIGEN VALUE ANALYSIS: Stability and free Vibration Analysis of Rectangular Plates.

UNIT - IV


UNIT - V

SHELLS: Shell structures in aerospace vehicles- Basic Concepts of Shell Type of Structures – Membrane analysis and Bending Theories for Circular Cylindrical Shells.

REFERENCES

OBJECTIVE

In this course it is aimed to introduce to the students the principles and applications of control systems in everyday life. The basic concepts of the block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

UNIT - I

Introduction
Simple pneumatic, hydraulic and thermal systems, analogies-mechanical and electrical components-development of flight control systems-Modeling of translational and rotational mechanical systems

UNIT - II

Open loop and Closed loop control systems
Concepts of control systems- Open loop and closed loop control systems. Characteristics of feedback control systems: System concept, differential equations and transfer functions. Block diagram representation of systems – Block diagram reduction methods – Closed loop transfer function, determination of signal flow graph. Mason’s gain formula.

UNIT - III

Time domain analysis
Test signals – time response of first order and second order systems – time domain specifications – types and order of systems – generalized error co-efficient – steady state errors.

UNIT - IV

Concept of Stability

UNIT - V

State variable analysis
State variable methods - introduction to the state variable concept - state space models -physical variable - phase variable and diagonal forms from time domain - solution of state equations - properties of state transition matrix - relation between transfer function and state space models, Controllability and Observability.
REFERENCES

UNIT - I

INTRODUCTION TO SATELLITE SYSTEMS: Common satellite applications and mission- Typical spacecraft orbits- Definitions of spin the three axis stabilization- Space environment- Launch vehicles-Satellite system and their functions (structure, thermal, mechanisms, power, propulsion, guidance and control, bus electronics).

UNIT - II

ORBITAL MECHANICS: Fundamental of flight dynamics – Time and coordinate systems-Orbit determination and prediction-Orbital maneuvers-GPS Systems and application for satellite/Orbit determination-Ground station network requirements

UNIT - III

SATELLITE STRUCTURES AND THERMAL CONTROL: Satellite mechanical and structural configuration: satellite configuration choices, launch loads, separation induced loads, deployment requirements-Design and analysis of satellite structures- Structural materials and fabrication-The need of thermal control: externally induced thermal environment-Internally induced thermal environment-Heat transfer mechanism: internal to the spacecraft and external heat load variations –Thermal control systems, active and passive methods.

UNIT - IV

SPACECRAFT CONTROL: Control requirements: attitude control and station keeping functions type of control maneuvers-Stabilization schemes: spin stabilization, gravity gradient methods, 3 axis stabilization-Commonly used control systems: mass expulsion systems, Momentum exchange Systems, gyro and magnetic torquer-sensors star and sun sensor, earth sensor, magnetometers and inertial sensors

UNIT - V

POWER SYSTEM AND BUS ELECTRONICS: Solar panels: Silicon and Ga-As cells, power generation capacity, efficiency-Space battery systems-battery types, characteristics and efficiency parameters-Power electronics. Telemetry and tele command systems. Tm&Tc functions, generally employed communication bands (UHF/VHF, S,L,Ku, Ka etc), their characteristics and applications-Coding systems – Onboard computer –Ground checkout systems.
REFERENCES

4. Introduction to Space Flight, Franceis J. Hale Prentice Hall, 1994
UNIT - I


UNIT - II

Combustion in Aircraft Piston Engine: Introduction to Combustion in Aircraft Piston Engines, Various Factors affecting the combustion Efficiency, Fuels used for Combustion in Aircraft Piston Engines and their Selection, Detonation in Piston Engine Combustion and The Methods to Prevent the Detonation

UNIT - III


UNIT - IV


UNIT - V

Supersonic Combustion: Introduction to Supersonic combustion, Need for supersonic combustion for hypersonic airbreathing propulsion, Supersonic combustion controlled by diffusion and heat convection - Analysis of reaction and mixing processes - Supersonic burning with detonation shocks.
REFERENCES

<table>
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1. Design of joints - bolted, riveted and welded joints
2. Design and Drafting Control Components Cam
3. Design and Drafting Control Components Bell Crank
4. Design and Drafting Control Components Gear
5. Design and Drafting Control Components Push-pull rod
6. Drafting of aircraft wing structural elements
7. Drafting of aircraft fuselage structural elements
8. Three view diagram of a typical aircraft
9. Layout of Control System
10. Estimation of forces and design of members in plane and space trusses using C-program
11. Estimation of forces and design of members in plane and space trusses using software package
12. Static analysis of beams using software packages
13. Static analysis of plates
14. Static analysis of shells
15. Dynamic analysis of beams
16. Thermal analysis of structures
1. Comparative study of different types of airplanes and their specifications and performance details

2. Preliminary weight estimations, selection of main parameters, Power plant selection, Aerofoil selection, Wing, tail and control surfaces, Landing Gear

3. Preparation of layouts of balance diagram and three view drawings

4. Drag estimation, performance calculations and stability estimates, V-n diagram for the design study

5. Preliminary design of an aircraft fuselage, load distribution on an aircraft fuselage

6. Preliminary design of an aircraft fuselage-design of bulkheads and longerons

7. Preparation of a detailed design report with drawings.
VIII-SEMESTER
Principles of Management and Ethics

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Objectives: To familiarise students with the management concepts, functions and processes. Also to make them socially responsible by demonstrating ethical behavior while discharging duties in their professional life.

UNIT - I

Management: Definition and nature; Goals and Levels of management; Managerial functions; Managing people for competitive advantage.

UNIT - II

Organizing: Nature, Formal and Informal Organisations, Organization levels and span of management; Departmentation - Modern Organisational Structures – Characteristics; Line and Staff concepts - Delegation, Centralization and Decentralization of authority;

UNIT - III

Directing: Meaning, Assumptions of Human Behaviour: Theory X & Theory Y; Leadership: Definition, Leadership behavior and styles, Recent approaches to leadership; Managerial Grid; Communication: Process, Methods;

UNIT - IV

ENGINEERING ETHICS & HUMAN VALUES:
Senses of ‘Engineering Ethics’, variety of moral issues, Moral dilemma and moral autonomy, Integrity, work Ethics, Respect for others, caring & sharing, Empathy, Service learning, character, spirituality, collegiality & loyalty, collective bargaining.

UNIT - V

Engineer as a social Experimenter: Engineering as Experimentation, Engineers as responsible experimenters, code of ethics (specific to a particular Engineering Discipline), Engineers as expert witnesses & advisors.

TEXT BOOKS


REFERENCES

T130  
BOUNDARY LAYER THEORY  

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**UNIT - I**

**Fundamental Equations of Viscous Flow:** Fundamental Equations of Viscous Flow, Conservation of Mass, Conservation of Momentum-Navier-Stokes Equations, Energy equation, Dimensional Parameters in Viscous Flow, Non dimensionalising the Basic Equations and Boundary conditions

**UNIT - II**

**Solutions of Viscous Flow Equations:** Couette Flows, Hagen-Poiseuille Flow, Flow between Rotating concentric Cylinders, Combined Couette-Poiseuille Flow between Parallel Plates, Creeping Motion, Stokes Solution for an Immersed Sphere, Development of boundary layer - Estimation of boundary layer thickness-Displacement thickness, momentum and energy thickness for two-dimensional flows

**UNIT - III**

**Laminar Boundary Layer:** Laminar boundary layer equations, Flat Plate Integral analysis of Energy equation, flow separation - Blasius solution for flat-plate flow – Falkner-Skan Wedge flows - Boundary layer temperature profiles for constant plate temperature – Integral equation of Boundary layer - Pohlhausen method - Thermal boundary layer calculations

**UNIT - IV**

**Turbulent Boundary Layer:** Turbulence-physical and mathematical description, Two-dimensional turbulent boundary layer equations - Velocity profiles - The law of the wall - The law of the wake - Turbulent flow in pipes and channels - Turbulent boundary layer on a flat plate - Boundary layers with pressure gradient, Eddy viscosity, Mixing length, Turbulence modeling

**UNIT - V**

**Compressible Boundary Layer:** Compressible boundary layer equation, Recovery factor, similarity solutions, laminar supersonic cone rule, shock-boundry layer interaction.

**REFERENCES**

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UNIT - I


UNIT - II

**Gas Liquefaction**: Minimum work for liquefaction – Methods to produce low temperature – Liquefaction systems for gases other than Neon, Hydrogen and Helium. Liquefaction systems for Neon, Hydrogen and Helium.

UNIT - III


UNIT - IV


UNIT - V

**Cryogenic fluid Storage & Transfer**: Cryogenic storage systems – Insulation Fluid transfer mechanics – Cryostat – Cryo Coolers.

**Applications**: Space technology – in-flight air separation and collection of LOX – Gas Industry – Biology - Medicine - Electronics.

REFERENCES

5. Refrigeration and Air-conditioning - Arora & Domkundwar, Dhanpat Rai & Co
UNIT - I


UNIT - II

STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR: Low cycle fatigue 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 - III


UNIT - IV

FATIGUE DESIGN AND TESTING: Safe life and Fail-safe design philosophies - Importance of Fracture Mechanics in aerospace structures - Application to composite materials and structures.

UNIT - V

REFERENCES

UNIT - I

WELDING IN AIRCRAFT STRUCTURAL COMPONENTS: Equipments used in welding shop and their maintenance – Ensuring quality welds –Welding jigs and fixtures – Soldering and brazing.


UNIT - II


UNIT - III


UNIT - IV

REVIEW OF HYDRAULIC AND PNEUMATIC SYSTEM: Trouble shooting and maintenance practices – Service and inspection. – Inspection and maintenance of landing gear systems. – Inspection and maintenance of air-conditioning and pressurisation system, water and waste system. Installation and maintenance of Instruments – handling – Testing – Inspection. Inspection and maintenance of auxiliary systems – Fire protection systems – Ice protection system – Rain removal system – Position and warning system – Auxiliary Power Units (APUs)

UNIT - V


REFERENCES

UNIT - I


UNIT - II


UNIT - III


UNIT - IV


UNIT - V

REFERENCES

1. Advanced Space Propulsion Systems, Martin Tajma, Springer
2. Advanced propulsion systems and technologies, today to 2020 Claudio Bruno, Antonio G. Accettura
UNIT - I

CLASSIFICATION OF PISTON ENGINE COMPONENTS: Types of piston engines – Principles of operation – Function of components – Materials used – Details of starting the engines – Details of carburetion and injection systems for small and large engines – Ignition system components – Spark plug details – Engine operating conditions at various altitudes – Maintenance and inspection check to be carried out.

UNIT - II


UNIT - III


UNIT - IV


UNIT - V

REFERENCES

UNIT - I


UNIT - II

ATMOSPHERIC BOUNDARY LAYER: Governing Equations – Mean velocity profiles, Power law, logarithmic law wind speeds, Atmospheric turbulence profiles – Spectral density function – Length scale of turbulence, Roughness parameters simulation techniques in wind tunnels

UNIT - III

BLUFF BODY AERODYNAMICS: Governing Equations – Boundary layers and separations – Wake and Vortex formation two dimensional – Strouhal Numbers, Reynolds numbers– Separation and Reattachments Oscillatory Flow patterns Vortex shedding flow switching– Time varying forces to wind velocity in turbulent flow – Structures in three dimensional

UNIT - IV


UNIT - V

AEROELASTIC PHENOMENA: Vortex shedding and lock in phenomena in turbulent flows, across wind galloping wake galloping - Torsional divergence, along wind galloping of circular cables, cross wind galloping of circular cables, Wind loads & their effects on tall structures – Launch vehicles

REFERENCES

2. Tom Lawson Building Aerodynamics Imperial College Press London, 2001
UNIT - I

LAUNCH VEHICLE CONFIGURATIONS AND DRAG ESTIMATION: Types of Rockets and missiles-various configurations-components-forces on the vehicle during atmospheric flight-nose cone design and drag estimation

UNIT - II

AERODYNAMICS OF SLENDER AND BLUNT BODIES: Aerodynamics of slender and blunt bodies, wing-body interference effects-Asymmetric flow separation and vortex shedding-unsteady flow characteristics of launch vehicles- determination of aero elastic effects, Slender Bodies of Revolution, non circular shapes, lifting surfaces, low Aspect Ratio characteristics, wing-body-tail interference, prediction of overall characteristics of body dominated configurations and lifting surface dominated configurations, high angle of attack aerodynamics

UNIT - III

HYPERSONIC AERODYNAMICS: Introduction to hypersonic aerodynamics, concept of thin shock layers-hypersonic flight paths-hypersonic similarity parameters-shock wave and expansion wave relations of in viscid hypersonic flows, Shock wave -boundary layer interactions, aerodynamic heating

UNIT - IV


UNIT - V

AERODYNAMIC LAUNCHING PROBLEMS: Introduction, Safety of parent Aircraft, Launch Boundaries-Launch-Aircraft Trajectory, Parent Aircraft Performance, Ground Launch
REFERENCES

UNIT - I


UNIT - II


UNIT - III


UNIT - IV

Jet Control Techniques: Introduction, Classification of Control Methods-Active and Passive, Role of Shear layer in Flow Control, Subsonic Shear Layer, Supersonic Shear Layer, Non-Circular Jets, Tab Controlled Jets

UNIT - V


REFERENCES

Fluid Dynamics of jets, SHIH-I PAI, Applied Gas Dynamics, E. Rathakrishnan, John Wiley and Sons (Asia) P.Ltd, 2010
Acoustic Control of Turbulent Jets, A.S. Ginevsky, Y.V. Vlasov, R.K. Karavosov, Springer
Turbulent Jets, N. Rajaratnam, Elsevier
## UNIT - I

**AEROELASTICITY PHENOMENA:** Vibration of Beams due to Coupling and Torsion, The Aero-elastic Triangle of Forces, Stability versus Response Problems, Aeroelasticity in Aircraft Design, Vortex Induced Vibration

## UNIT - II

**DIVERGENCE OF A LIFTING SURFACE:** Simple Two Dimensional Idealizations, Strip Theory, Fredholm Integral Equation of the Second Kind, Exact solutions for simple rectangular wings, Semirigid assumption and approximate solutions, Generalized coordinates, Successive approximations, Numerical approximations using matrix equations.

## UNIT - III

**STEADY STATE AEROELASTIC PROBLEMS:** Loss and reversal of aileron control, Critical aileron reversal speed, Aileron efficiency, Semirigid theory and successive approximations, Lift distributions, Rigid and elastic wing.

## UNIT - IV

**FLUTTER PHENOMENON:** Non-dimensional parameters, Stiffness criteria, Dynamic mass balancing, Model experiments, Dimensional similarity, Flutter analysis, Two dimensional thin airfoils in steady incompressible flow, Quasi-steady aerodynamic derivatives, Galerkin method for critical speed, Stability of distributed motion, Torsion flexure flutter, Solution of the flutter determinant, Methods of determining the critical flutter speeds, Flutter prevention and control.

## UNIT - V

**AEROELASTIC PROBLEMS IN CIVIL AND MECHANICAL ENGINEERING:** Galloping of transmission lines and flow induced vibrations of tall slender structures and suspension bridges.

## REFERENCES