Hindustan Institute of Technology & Science

Padur, Kancheepuram District - 603 103.

Syllabus with
Curriculum and Regulations
2008

B.E.
AERONAUTICAL ENGINEERING

ACADEMIC REGULATIONS (B.E. / B.Tech)

1. Vision, Mission and Objectives

1.1 The Vision of the Institute is "To make everyone a success and no one a failure".

In order to progress towards the vision, the Institute has identified itself with a mission to provide every individual with a conducive environment suitable to achieve his / her career goals, with a strong emphasis on personality development, and to offer quality education in all spheres of engineering, technology, applied sciences and management, without compromising on the quality and code of ethics.

1.2 Further, the Institute always strive

- To train our students with the latest and the best in the rapidly changing fields of Engineering, Technology, Management, Science & Humanities.
- To develop the students with a global outlook possessing, state of the art skills, capable of taking up challenging responsibilities in the respective fields.
- To mould our students as citizens with moral, ethical and social values so as to fulfill their obligations to the Nation and the society.
- To promote research in the field of science, Humanities, Engineering, Technology and allied branches.

1.3 Aims and Objectives of the Institute are focused on

- Providing world class education in engineering, technology, applied sciences and management.
- Keeping pace with the ever changing technological scenario to help the students to gain proper direction to emerge as competent professionals fully aware of their commitment to the society and nation.
- To inculcate a flair for research, development and entrepreneurship.

2. Admission

2.1. The admission policy and procedure shall be decided from time to time by the Board of Management (BOM) of the Institute, following guidelines issued by Ministry of Human Resource Development (MHRD), Government of India. The number of seats in each branch of the B.E. / B.Tech programme will be decided by BOM as per the directives from MHRD, Government of India and taking into account the market demands. Some seats for Non Resident Indians and a few seats for Foreign nationals shall be made available.

2.2.At the time of applying for admission, the candidates should have passed / appeared and be awaiting results of the final examination of the 10+2 system or its equivalent with Mathematics, Physics and Chemistry as subjects of study.

2.3. The selected candidates will be admitted to the B.E./ B.Tech. programme after he/she fulfills all the admission requirements set by the Institute after payment of the prescribed fees.

2.4. In all matters relating to admission to the B.E. / B.Tech. programme, the decision of the Institute and its interpretation given by the Chancellor of the Institute shall be final.

2.5. If at any time after admission, it is found that a candidate has not fulfilled any of the requirements stipulated by the Institute; the Institute may revoke the admission of the candidate with information to the Academic Council.

3. Structure of the programme

3.1. The programme of instruction will have the following structure:

i) A general(common) core programme comprising basic sciences, engineering sciences, humanities, technical arts and mathematics.

ii) An engineering core programme introducing the student to the foundations of engineering in the respective branch.

iii) An elective programme enabling the student to opt and undergo a set of courses of interest to him/ her.

iv) Professional practice including project, seminar and industrial training .

v) General elective courses, such as, Environmental Studies, Physical Education, Professional ethics, and National Service Scheme.

The distribution of total credits required for the degree programme into the above five categories will nominally be 20%, 50%, 15%, 5%, and 10% respectively.

3.2 The duration of the programme will be a minimum of 8 semesters. Every branch of the B.E. / B.Tech. programme will have a curriculum and syllabi for the courses approved by the Academic Council.

3.3 The academic programmes of the Institute follow the credit system. The general pattern is:

- One credit for each lecture hour per week per semester;
- One credit for each tutorial hour per week per semester;
- One credit for each laboratory practical (drawing) of three (two) hours per week per semester.
- One credit for 4 weeks of industrial training and
- One credit for 4 hours of project per week per semester

3.4. For the award of degree, a student has to earn certain minimum total number of credits specified in the curriculum of the relevant branch of study. The curriculum of the different programs shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits of 180-190.

3.5. The medium of instruction, examination and the language of the project reports will be English.

4. Faculty Advisor

4.1. To help the students in planning their courses of study and for getting general advice on the academic programme, the concerned Department will assign a certain number of students to a Faculty member who will be called their Faculty Advisor.

5. Class Committee

5.1 A Class Committee consisting of the following will be constituted by the Head of the Department for each class:

(i) A Chairman, who is not teaching the class.

(ii) All subject teachers of the class.

(iii) Two students nominated by the department in consultation with the class.

The Class Committee will meet as often as necessary, but not less than three times during a semester.

The functions of the Class Committee will include:

(i) Addressing problems experienced by students in the classroom and the laboratories.

(ii) Analyzing the performance of the students of the class after each test and finding ways and means of addressing problems, if any.

(iii) During the meetings, the student members shall express the opinions and suggestions of the class students to improve the teaching / learning process.

6. Grading

6.1 A grading system as below will be adhered to.

Range of Marks	Letter Grade	Grade points
95-100	S	10
85 - 94	A	09
75- 84	B	08
65-74	C	07
55-64	D	06
50-54	E	05
< 50	U	00
	I (Incomplete)	--

6.2 GPA and CGPA

GPA is the ratio of the sum of the product of the number of credits C_i of course "i " and the grade points P_i earned for that course taken over all courses "i" registered by the student to the sum of C_i for all "i ". That is,

$$GPA = \frac{\sum_i C_i P_i}{\sum_i C_i}$$

CGPA will be calculated in a similar manner, at any semester, considering all the courses enrolled from first semester onwards.

6.3. For the students with letter grades W / I in certain subjects, the same will not be included in the computation of GPA and CGPA until after those grades are converted to the regular grades S to F.

6.4 Raw marks will be moderated by a moderation board appointed by the Vice Chancellor of the University. The final marks will be graded using absolute grading system. The Constitution and composition of the moderation board will be dealt with separately.

7. Registration and Enrolment

7.1 Except for the first semester, registration and enrollment will be done in the beginning of the semester as per the schedule announced by the University.

7.2 A student will be eligible for enrollment only if he/she satisfies regulation 10 (maximum duration of the programme) and will be permitted to enroll if (i) he/she has cleared all dues in the Institute, Hostel and Library up to the end of the previous semester and (ii) he/she is not debarred from enrollment by a disciplinary action of the University.

7.3. Students are required to submit registration form duly filled in.

8. Registration requirement

8.1. A full time student shall not register for less than 16 credits or more than 26 credits in any given semester.

8.2 If a student finds his/her load heavy in any semester, or for any other valid reason, he/she may withdraw from the courses within three weeks of the commencement of the semester with the written approval of his/her Faculty Advisor and HOD. However the student should ensure that the total number of credits registered for in any semester should enable him/her to earn the minimum number of credits per semester for the completed semesters.

9. Minimum requirement to continue the programme

9.1 For those students who have not earned the minimum required credit prescribed for that particular semester examination, awarring letter to the

concerned student and also to his parents regarding the shortage of this credit will be sent by the HOD after the announcement of the results of the university examinations.

10. Maximum duration of the programme

10.1. The normal duration of the programme is eight semesters. However a student may complete the programme at a slower pace by taking more time, but in any case not more than 14 semesters excluding the semesters withdrawn on medical grounds or other valid reasons.

11. Temporary discontinuation

11.1. A student may be permitted by the Dean (Academic) to discontinue temporarily from the programme for a semester or a longer period for reasons of ill health or other valid reasons. Normally a student will be permitted to discontinue from the programme only for a maximum duration of two semesters.

12. Discipline

12.1. Every student is required to observe discipline and decorous behavior both in-side and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the University.

12.2. Any act of indiscipline of a student reported to the Dean (Academic) will be referred to a Discipline Committee so constituted. The Committee will en-quire into the charges and decide on suitable punishment if the charges are substantiated. The committee will also authorize the Dean (Academic) to recommend to the Vice Chancellor the implementation of the decision. The student concerned may appeal to the Vice Chancellor whose decision will be final. The Dean (Academic) will report the action taken at the next meeting of the Council.

12.3. Ragging and harassment of women are strictly prohibited in the University campus and hostels.

13. Attendance

13.1. A student whose attendance is less than 75% for a course is not eligible to appear for the end – semester examination for that course. The details of all students who have less than 75% attendance in a course will be announced by the teacher in the class. These details will be sent to the concerned HODs and Dean (Academic).

13.2. Those who have 75% or more attendance for the period other than their medical leave will be considered for condonation of shortage of attendance provided the overall attendance including the period of illness does not fall below 65%. Application for condonation recommended by the Faculty Advisor, concerned faculty member and the HOD is to be submitted to the Dean (Academic) who, depending on the merits of the case, may permit the student to appear for the end semester examination. A student will be eligible for this concession at most in two semesters during the entire degree programme. Application for medical leave, supported by medical certificate with endorsement by a Registered Medical Officer, should reach the HOD within seven days after returning from leave or, on or before the last instructional day of the semester, whichever is earlier.

13.3 As an incentive to those students who are involved in extra curricular activities such as representing the University in Sports and Games, Cultural Festivals, and Technical Festivals, NCC/ NSS events, a relaxation of up to 10% attendance will be given subject to the condition that these students take prior approval from the officer – in-charge. All such applications should be recommended by the concerned HOD and forwarded to Dean (Academic) within seven instructional days after the programme / activity.

14. Assessment Procedure

14.1. The Academic Council will decide from time to time the system of tests and examinations in each subject in each semester.

14.2 For each theory course, the assessment will be done on a continuous basis as follows:

Test / Exam	Weigh - tage	Duration of Test / Exam
First Periodical Test	15%	1 Period
Second Periodical Test	15%	1 Period
Third Periodical Test	20%	2 Periods
End – semester examination	50%	3 Hours

14.3 For practical courses, the assessment will be done by the subject teachers as below:

(i) Weekly assignment/Observation note book / lab records – weightage 60%.
(ii) End semester examination of 3 hours duration including viva – weightage 40%.

14.4 For courses on Physical Education, NSS, etc the assessment will be as satisfactory/not satisfactory only.

15. Make up Examination/Periodical Test

15.1. Students who miss the end-semester examinations / periodical test for valid reasons are eligible for make-up examination /periodical test. Those who miss the end-semester examination / periodical test should apply to the Head of the Department concerned within five days after he / she missed examination, giving reasons for absence.

15.2. Permission to appear for make-up examination/periodical test will be given under exceptional circumstances such as admission to a hospital due to illness. Students should produce a medical certificate issued by a Registered Medical Practitioner certifying that he/she was admitted to hospital during the period of examination / periodical test and the same should be duly endorsed by parent/guardian and also by a medical officer of the University within 5 days.

15.3. The student will be allowed to make up at the most two out of three periodical tests and end – semester examination.

16. Project evaluation

16.1 For Project work, the assessment will be done on a continuous basis as follows:

Review / Exam	Weightage
First Review	10%
Second Review	20%
Third Review	20%
End - semester Exam	50%

For end – semester exam, the student will submit a Project Report in a format specified by the Dean (Academic). The first three reviews will be conducted by a Committee constituted by the Head of the Department. The end – semester examination will be conducted by a Committee constituted by the Registrar / Controller of examination. This will include an external expert.

17. Declaration of results

17.1 A candidate who secures not less than 50% of total marks prescribed for a course with a minimum of 50% of the marks prescribed for the end semester examination shall be declared to have passed the course and earned the specified credits for the course.

17.2 After the valuation of the answer scripts, the tabulated results are to be scrutinized by the Result Passing Boards of UG and PG programmes constituted by the Vice-Chancellor. The recommenda- tions of the Result Passing

Boards will be placed before the Standing Sub Committee of the Academic Council constituted by the Chancellor for scrutiny. The minutes of the Standing Sub Committee along with the results are to be placed before the Vice-Chancellor for approval. After getting the approval of the Vice-Chancellor, the results will be published by the Controller of Exami- nation / Registrar.

17.3 If a candidate fails to secure a pass in a course due to not satisfying the minimum requirement in the end semester examination, he/she shall register and re-appear for the end semester examination during the following semester. However, the internal marks secured by the candidate will be retained for all such attempts.

17.4 If a candidate fails to secure a pass in a course due to insufficient sessional marks though meeting the minimum requirements of the end semester examination, wishes to improve on his/her sessional marks, he/she will have to register for the particular course and attend the course with permission of the HOD concerned and Dean with a copy marked to the Registrar. The sessional and external marks obtained by the candidate in this case will replace the earlier result.

17.5 A candidate can apply for the revaluation of his/her end semester examination answer paper in a theory course within 2 weeks from the declaration of the results, on payment of a prescribed fee through proper application to the Registrar/Controller of Examinations through the Head of the Department. The Registrar/ Controller of Examination will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses and for project work.

18. Grade Card

18.1 After results are declared, grade sheet will be issued to each student which will contain the following details:

(i) Program and branch for which the student has enrolled.
(ii) Semester of registration.
(iii) List of courses registered during the semester and the grade scored.
(iv) Semester Grade Point Average (GPA)
(v) Cumulative Grade Point Average (CGPA).

19. Class/Division

Classification is based on CGPA and is as follows:
CGPA≥8.0: **First Class with distinction**
6.5 ≥CGPA < 8.0: **First Class**
5.0 ≥CGPA < 6.5: **Second Class.**

20. Transfer of credits

20.1. Within the broad framework of these regulations, the Academic Council, based on the recommendation of the transfer of credits committee so consulted by the Chancellor may permit students to earn part of the credit requirement in other approved institutions of repute and status in the country or abroad.

20.2 The Academic Council may also approve admission of lateral entry (who hold a diploma in Engineering/ technology) candidates with advance credit based on the recommendation of the transfer of credits committee on a case to case basis.

21. Eligibility for the award of B.E. / B.Tech. Degree

21.1. A student will be declared to be eligible for the award of the B.E. / B.Tech. Degree if he/she has

i) registered and successfully credited all the core courses;
ii) successfully acquired the credits in the different categories as specified in the

curriculum corresponding to the discipline (branch) of his/her study within the stipulated time;

iii) has no dues to all sections of the Institute including Hostels, and

iv) has no disciplinary action pending against him/her.

The award of the degree must be recommend ded by the Academic Council and approved by the Board of Management of the University.

22. Change of Branch

22.1 If the number of students in any branch of B.E. / B.Tech. class as on the last instructional day of the First Semester is less than the sanctioned strength, then the vacancies in the said branches can be filled by transferring students from other branches. All such transfers will be allowed on the basis of merit of the students. The decision of the Chancellor shall be final while considering such requests.

22.2 All students who have successfully completed the first semester of the course will be eligible for consideration for change of branch subject to the availability of vacancies.

23. Power to modify

23.1. Notwithstanding all that has been stated above, the Academic Council shall modify any of the above regulations from time to time subject to approval by the Board of Management.

HINDUSTAN UNIVERSITY

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE

B.E – Mechanical Engineering

SEMESTER - I

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	EL 1101	English – I	3	0	1	3	**4**
2	MA1101	Engineering Mathematics – I	3	1	0	4	**4**
3	PH1101	Engineering Physics – I	3	1	0	4	**4**
4	CY1101	Engineering Chemistry – I	3	1	0	4	**4**
5	ME1101	Engineering Graphics	3	0	3	4	**6**
6	CS1101	Computer Programming	3	1	0	4	**4**
PRACTICAL							
7	CS1131	Computer Programming Laboratory	0	0	3	1	**3**
8#	GE1101	Engineering Practices Laboratory	0	0	3	1	**3**
	GE1102	Physical Sciences Laboratory					
9	GE1103	NSS/NCC/NSO/YRC	0	0	2	0	**2**
		Total				**25**	**34**

To be decided by the department

SEMESTER - II

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	EL1102	English – II *	3	0	1	3	**4**
2	MA1102	Engineering Mathematics – II *	3	1	0	4	**4**
3	PH1102	Engineering Physics – II **	3	1	0	4	**4**
4	CY1102	Engineering Chemistry – II *	3	1	0	4	**4**
5	EE1105	Basic Electrical and Electronics engineering	3	1	0	4	**4**
6	ME1102	Engineering Mechanics ***	3	1	0	4	**4**
PRACTICAL							
7#	GE1101	Engineering Practices Laboratory	0	0	3	1	**3**
	GE1102	Physical Sciences Laboratory	0	0	3	1	**3**
8	AE 1101	Computer Aided Drafting &Modeling Laboratory	0	0	3	1	**3**
		Total				**25**	**30**

To be decided based on Semester I

* Common to all Branches

** Common to all Branches Except IT

*** Common to Aeronautical, Automobile, Civil, EEE, EIE & Aerospace

SEMESTER - III

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	MA1203	Engineering Mathematics - III *	3	1	0	4	**4**
2	ME1202	Fluid Mechanics and Machinery ****	3	1	0	4	**4**
3	AE1201	Aircraft materials	3	0	0	3	**3**
4	AE1202	Aero Engineering Thermodynamics	3	1	0	4	**4**
5	AE1203	Solid Mechanics	3	1	0	4	**4**
6	AE1204	Elements of Aeronautics	3	0	0	3	**3**
PRACTICAL							
7	AE1205	Strength of Materials Lab	0	0	3	1	**3**
8	AE1206	Design and Drafting Lab	0	0	3	1	**3**
9	AE 1207	Thermodynamics Lab	0	0	3	1	**3**
		Total				**25**	**31**

SEMESTER - IV

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	MA1204	Numerical Methods ****	3	1	0	4	**4**
2	AT1204	Mechanics of Machines	3	1	0	4	**4**
3	AE1208	Aerodynamics – I	3	1	0	4	**4**
4	AE1209	Aircraft Systems and Instrumentation	3	0	0	3	**3**
5	AE1210	Aircraft Structures – I	3	1	0	4	**4**
6	AE1211	Control Engineering	3	0	0	3	**3**
PRACTICAL							
7	AE1212	Aircraft Structures Lab – I	0	0	3	1	3
8	AE1213	Fluid Mechanics & Machinery Lab	0	0	3	1	3
9	AE1214	Aerodynamics Lab	0	0	3	1	3
		Total				**25**	**31**

****Common to Aeronautical, Automobile, EEE, Mechanical & Aerospace engineering

SEMESTER - V

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	EC1319	Microprocessor and Applications	3	0	0	3	**3**
2	AE1301	Civil Aviation Requirement-I	3	0	0	3	**3**
3	AE1302	Flight Dynamics	3	1	0	4	**4**
4	AE1303	Aircraft Structures – II	3	1	0	4	**4**
5	AE1304	Aerodynamics – II	3	1	0	4	**4**
6	AE1305	Propulsion-I	3	1	0	4	**4**
PRACTICAL							
7	AE1306	Aircraft Structures Lab – II	0	0	3	1	**3**
8	AE1307	Aircraft Structures Repair Lab	0	0	3	1	**3**
9	AE1308	Propulsion-I Lab	0	0	3	1	**3**
		Total				**25**	**31**

SEMESTER - VI

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	AE1309	Civil Aviation Requirement-II	3	0	0	3	**3**
2	AE1310	Propulsion-II	3	1	0	4	**4**
3	AE1311	Heat Transfer	3	1	0	4	**4**
4	AE1312	Experimental Stress Analysis	3	0	0	3	**3**
5	AE1313	High Temperature Materials	3	0	0	3	**3**
6	AE1314	Air transportation and Aircraft Maintenance	3	0	0	3	**3**
PRACTICAL							
7	AE1315	Aircraft Design Project – I	0	0	3	1	**3**
8	AE1316	Propulsion-II Lab	0	0	3	1	**3**
9	AE1317	Aero Engine Repair and Maintenance Lab	0	0	3	1	**3**
10	EL1331	Communication skills lab *	2	0	2	3	**4**
						26	**33**

* Common to all Branches

SEMESTER - VII

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	CE1403	Environmental Science and Engineering	3	0	0	3	**3**
2	MG1401	Total Quality Management *	3	0	0	3	**3**
3	AE1401	Avionics	3	0	0	3	**3**
4	AE1402	Composite Materials and Structures	3	0	0	3	**3**
5	-	Elective – I	3	0	0	3	**3**
6	-	Elective – II	3	0	0	3	**3**
PRACTICAL							
7	AE1403	Aircraft Design Project – II	0	0	3	1	**3**
8	AE1404	Aircraft Systems Lab	0	0	3	1	**3**
9	AE1405	Avionics Lab	0	0	3	1	3
10	AE1406	Identification of Project Work**	0	0	2	-	2
						21	**29**

SEMESTER - VIII

Sl. No	Course Code	Course Title	L	T	P	C	TCH
THEORY							
1	AE1407	Rockets and Missiles	3	0	0	3	**3**
2	-	Elective – III	3	0	0	3	**3**
3	-	Elective – IV	3	0	0	3	**3**
PRACTICAL							
4	AE1408	Project Work	0	0	24	6	**24**
						15	**33**

* Common To All Branches

TOTAL NO. OF CREDIT = 187

ELECTIVE COURSES – VII SEMESTER

Sl. No	Course Code	Course Title	L	T	P	C	TCH
1	GE1401	Professional Ethics and Human values *	3	0	0	3	**3**
2	AE1409	Theory of Elasticity	3	0	0	3	**3**
3	AE1410	Space Mechanics	3	0	0	3	**3**
4	AE1411	Aircraft General Engineering and Maintenance Practices	3	0	0	3	**3**
5	AE1412	Wind Tunnel Techniques	3	0	0	3	**3**
6	AE1413	Vibration and Aero elasticity	3	0	0	3	**3**
7	AE1414	Finite Element Method	3	0	0	3	**3**
8	AE1415	Airframe Maintenance and Repair	3	0	0	3	**3**

ELECTIVE COURSES – VIII SEMESTER

Sl. No	Course Code	Course Title	L	T	P	C	TCH
1	MG1402	Entrepreneurship Development *	3	0	0	3	**3**
2	AE1416	Aero Engine Maintenance and Repair	3	0	0	3	**3**
3	AE1417	Theory of Plates and Shells	3	0	0	3	**3**
4	AE1418	Computational Fluid Dynamics	3	0	0	3	**3**
5	AE1419	Fatigue and Fracture Mechanics	3	0	0	3	**3**
6	AE1420	Helicopter Maintenance	3	0	0	3	**3**
7	AE1421	Air Traffic Control and Aerodrome Design	3	0	0	3	**3**
8	AE1422	Computer Integrated Manufacturing	3	0	0	3	3

* Common To All Branches

SEMESTER – I

EL 1101 ENGLISH - I

(Common to All Branches)

L	T	P	C
3	0	1	3

AIM:

- To encourage engineering students with different backgrounds to actively take part in learning and using the English language in their day to day communication activitie

OBJECTIVES:

- To help students learn some important grammar components and express themselves in flawless English
- To help students to equip themselves with a sound vocabulary.
- To help students develop listening skill for academic and professional purposes
- To help students to speak English fluently
- To enable students to develop effective reading skills and develop reading habit
- To enable students to write short pieces cohesively and coherently

UNIT- I GRAMMAR 9

Countable and uncountable nouns, The plural number, Genitive and possessive forms, Pronouns, Determiners, definite and indefinite articles, Adjectives, Main and auxiliary verbs, Transitive and intransitive , Finite and non finite verbs, Linking verbs, Regular and irregular verbs, Phrasal verbs, Infinitives and gerunds, Participles, Adverbs, Model Verbs, Comparisons, Tenses, Concord, Active and Passive voices, Direct and Indirect speeches, Conditionals, Question types, Prepositions, Conjunctions, Prefixes and Suffixes, Compound Nouns, Synonyms, Super: Ordinates and hyponyms, Expressing causal relation , Comparative adjectives, Punctuation, Use of reference words Statements, Questions,

SUGGESTED ACTIVITIES

Providing different contexts for using tenses – Changing the grammatical functions of words using prefixes and suffixes – Changing Voices – Rewriting sentences in impersonal passive forms – Use of 'If' Conditionals in sentences – Use of reference words in reading texts – Expansion of compound nouns – Using appropriate comparative adjectives – Rewriting expressions – using numerical adjectives – Use of model verbs in sentences – Correction of sentences – Use of appropriate reporting verbs in indirect speech – Gap filling activity using relative pronouns – Fill in the blanks with suitable prepositions, prepositional phrases, phrasal verbs – Framing Wh – questions – 'Yes/No' types and question tags – Rewriting imperative sentences using 'Should'

UNIT II LISTENING 6

Listening for general content, Listening for specific information, Listening for note making, Listening to speeches by great people and some poems.

SUGGESTED ACTIVITIES:

Listening to the text and answering questions (multiple choices, gap filling) - Listening and identifying specific information – guided and unguided note-taking – Making inferences while listening.

UNIT III SPEAKING 6

Self and peer introduction, Conversational practice in different situations, Oral presentations on various topics, Reciting speeches and poems

SUGGESTED ACTIVITIES:

Listening to English sounds and words and repeating them – Introducing self and others – Role play activities – Making presentation on given topics – describing people,objects,processes.

UNIT IV READING 12

Predicting content, Skimming text for gist, scanning for specific information, Study reading, Extensive reading.

SUGGESTED ACTIVITIES:

Taking a quick glance at the text (Skimming) and predicting the content - Reading to identify the main ideas (scanning for specific information, analyzing and interpreting data from tables and charts - sequencing of jumbled sentences using linguistics clues.

Note: Extensive reading: Students may be asked to read the books suggested for extra reading and submit assignments. Assignments can be in the form of review-criticism, appreciation etc.

UNIT V WRITING 12

Definition, Extended definition Trans coding from non verbal form to verbal form of writing. Paragraph writing, Discourse markers, Cohesion and Coherence, writing general essays, Social correspondence.

SUGGESTED ACTIVITIES:

Using appropriate expressions of defining – Writing a paragraph based on information provided in a flow charts / bar charts / tables –Writing letters of different types – Writing recommendations, Letter to Editor, Invitation, Expressing thanks etc.

L=45 P=15 TOTAL : 60

TEXT BOOKS:

1. Chellammal.V. 'Learning to communicate' a Resources book for scientist and technologists English II Chennai Allied publishers private ltd: 2004
2. Farhathullah.T.M. English practice book for Engineering Students. Chennai, Emerald publishers 2000.
3. A P J ABDUL KALAM with Arun Thivari Wings of Fire an Auto Biography. University Press (India) P ltd 1999 30th impression 2007

REFERENCE

1. Joseph KV. A Text Book of English Grammar and Usage. Chennai; Vijay Nicole Imprints Pvt ltd 2006.

MA1101 – ENGINEERING MATHEMATICS - I

(Common to All Branches)

L	T	P	C
3	1	0	4

AIM

- The course is aimed at developing the basic Mathematical skills of Engineering students that are imperative for effective understanding of Engineering subject.

OBJECTIVE

- To identify algebraic eigenvalue problems from practical areas and obtain the eigensolutions in certain cases.
- To diagonalize a matrix which would render the eigensolution procedure very simple.
- To understand effectively the geometrical aspects of curvature, maxima and minima concept as elegant applications of differential calculus.
- To solve differential equations of certain type, that they might encounter in the same or higher semesters.

UNIT I MATRICES 12

Characteristic equations – Properties of Eigen values – Eigen values and Eigen vectors– Cayley Hamilton theorem (without proof) – Verification and inverse by Cayley Hamilton theorem. Diagonalisation of a matrix – Orthogonal matrices - Matrix forms of quadratic and canonical form– Reduction to canonical form of the given quadratic by orthogonal transformation.

UNIT II DIFFERENTIAL CALCULUS 12

Curvature - Radius of curvature – Centre of curvature – Circle of curvature – Cartesian co-ordinates – Geometrical application of differential calculus – Evolute, Envelope – Properties of Envelope

UNIT III ORDINARY DIFFERENTIAL EQUATIONS 12

Second order differential equations with constant coefficients – Particular integrals - Exponential - Trignometric – Algebraic functions - e αx f(x), x m Cosx,x m Sin x - Variation of parameters – Homogeneous linear second order differential equations – Simultaneous first order linear equation with constant coefficients

UNIT IV: PARTIAL DIFFERENTIATION 12

Differentiation of functions of two and three variables – Total differential coefficient – Taylor's series – Maxima and minima of functions of two and three variables – Constrained maxima and minima – Lagrange's method of multiplier – Jacobians.

UNIT V: ANALYTICAL GEOMETRY OF THREE DIMENSIONA 12

Direction cosines and ratios – Angle between two lines – Equations of a plane – Equations of a straight line – Coplanar lines – Shortest distance between skew lines – Sphere – Tangent plane – Plane section of a sphere – Orthogonal Spheres.

TOTAL : 60

TEXT BOOKS

1. Erwin Kreyzig, A Text book of Engineering Mathematics ,John Wiley.
2. Grewal B.S., Higher Engineering Mathematics, Delhi, Thirty Eighth Edition, Khanna Publisher, 2004.
3. Chandrasekaran A. A Text book of Engineering Mathematics-I, Chennai, Dhanam Publications.

REFERENCES

1. Venkataraman.M.K. , Engineering Mathematics ,Volume I, Chennai, The National Publishing Company,
2. KandaswamyPThilagavathy. .,K. and.Gunavathy. K Engineering Mathematics Volume I & II, New Delhi, S.Chand and Company, 2005.
3. Bali. N.P. and Narayana Iyengar. N.Ch., Engineering Mathematics, New Delhi, Laxmi Publications Pvt. Ltd, 2003.
4. Veerarajan. T., Engineering Mathematics (for first year), Fourth Edition, New Delhi, Tata McGraw – Hill Publishing Company Limited, 2005.

PH1101 – ENGINEERING PHYSICS I

(Common to All Branches)

L	T	P	C
3	1	0	4

AIM

- To develop strong fundamentals of science for engineering applications

OBJECTIVE

- To enhance theoretical and modern technological aspects in physics.
- To enable the students to correlate the theoretical principles with application oriented studies.
- To impart fundamental knowledge in various engineering subjects and applications.

UNIT – I PROPERTIES OF MATTER 12

Elasticity – types of moduli of elasticity – stress strain diagram – Young's modulus of elasticity – rigidity modulus – bulk modulus – Factors affecting elasiticity – twisting couple on a wire – Torsional pendulum – determination of rigidity modulus of a wire – depression of a cantilever – Young's modulus by cantilever – uniform and non uniform bending viscosity – Ostwalds viscometer – comparision of viscosities.

UNIT – II ACOUSTICS AND ULTRASONICS 12

Classification of sound – characteristics of musical sound – intensity – loudness – Weber Fechner law – Decibel – reverberation – reverberation time, derivation of Sabine's formula for reverberation time (Jager's method) – absorption coefficient and its determination – factors affecting acoustics of building (Optimum reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies. Ultrasonics production – Magnetostriction and piezoelectric methods – properties, - applications of ultrasonics with particular reference to detection of flaws in metal (Non – Destructive testing NDT) – SONAR.

UNIT – III HEAT AND THERMODYNAMICS 12

Thermal conductivity – experimental determination of thermal conductivities of good and bad conductors – Forbe's method – theory and experiment – Lee's disc method for bad conductors – Isothermal process – adiabatic process – reversible process – irreversible process – Carnot's cycle – heat engines Otto engine – diesel engine.

UNIT – IV OPTICS 12

Air wedge theory and experiment – testing of flat surfaces – anti reflection coating – Michelson interferometer – types of fringes, determination of wavelength of monochromatic source and

thickness of a thin transparent sheet – Double refraction – Photoelasticity – Photoelastic effect – Photoelastic analysis – Photoelastic material – Block diagram of Photoelastic bench.

UNIT – V LASER AND FIBRE OPTICS 12

Principle of lasers – Stimulated absorption – spontaneous emission, stimulated emission – population inversion – pumping action – active medium – laser characteristics – Nd-Yag laser – CO2 laser – Semiconductor laser – applications Optical fibre – principle and propagation of light in optical fibres – Numerical aperture and acceptance angle – types of optical fibres – single and multimode, step index and graded index fibres – applications – fiber optic communication system.

TOTAL : 60

TEXT BOOKS

1. Gaur R.K. and Gupta S.L., Engineering physics, 8th edition, Dhanpat rai publications (P) Ltd., New Delhi 2003.
2. P. Mani, Engineering Physics, Vol-I, Dhanam Publications, Chennai 2005.

REFERENCES

1. Uma Mukherji, Engineering physics, Narosa publishing house, New Delhi, 2003.
2. Rajendran V and Marikani A., Applied physics for engineers, 3rd edition, Tata Mcgraw – Hill publishing company Ltd., New Delhi, 2003.
3. Arumugam M., Engineering physics, Anuradha agencies, 2007.
4. Palanisamy P.K., Engineering Physics, Scitech publications, Chennai 2007.

CY 1101 - ENGINEERING CHEMISTRY I

(Common to All Branches)

L	T	P	C
3	1	0	4

AIM

Upon graduation, the student will be well prepared to assume responsibilities in his/her field of specialization or continue his/her professional development through graduate studies.

OBJECTIVES

- To provide a sound fundamental knowledge of chemistry
- To instill the scientific temper and the spirit of enquiry in students
- To encourage students to understand and apply the physical laws to the development of their fields of study

UNIT I WATER TECHNOLOGY 12

Water Quality Parameter-Hardness(Definition, Types, Units) – Simple problems - Estimation of Hardness (EDTA Method)- Boiler Feed Water- Requisites- boiler troubles -Water Softening Internal Conditioning (carbonate, calgon and phosphate conditioning)-Lime Soda Process- problems – Demineralization (Ion-Exchange Method)- Municipal Water Treatment-Desalination (Reverse Osmosis and Electrodialysis)

UNIT II POLYMER CHEMISTRY 12

Related Terminology-Types of Polymers-Polymerisation Types- Mechanism of Polymerization (Free Radical Mechanism / Ionic / Co-ordination)-Thermoplastics & Thermosetting Plastics (PE, PVC, Bakelite and epoxy resins–preparation, properties and applications)-Effect of Polymer Structure on Properties- Compounding of Plastics-Molding Methods (compression moulding and injection moulding) - Polymer Composites, Blends, LCP's -Definition, Examples and uses

UNIT III ELECTROCHEMISTRY 12

Technical Terms (Definition, expressions, simple problems)-Kohlrausch law-Effect of dilution on 'K' and 'Λ' – Determination of 'Λ' at infinite dilution for strong electrolytes - Conductometric Titrations (four types)- Electrochemical Series- Applications-EMF Measurement (Experimental determination) - Nernst Equation (simple problems) -Types of electrodes –concentration cells-Reversible and irreversible cells - Decompostion Potential – Over-voltage

UNIT IV CHEMICAL THERMODYNAMICS 12

Thermodynamic terminology- First Law of Thermodynamics-Internal energy – Enthalpy – Heat capacity – Work done at isothermal expansion of an ideal gas – Problems – Second law of thermodynamics – Entropy change – Phase transformations and entropy change – problems - Work Function & Free Energy Function-Maxwell's Relations-Gibbs Helmholtz equation- Van't Hoff Isotherm- Van't Hoff Isochore(Problems)

UNIT V BASIC ANALYTICAL TECHNIQUES 12

Electromagnetic spectrum-Transitions (electronic, vibrational ,rotational) – Beer-Lambert's Law-UV Visible spectrophotometer – Principle and Instrumentation (block diagram and applications) –Estimation of iron by colorimeter – Flame photometer – Principle, Instrumentation with block diagram and applications- Estimation of sodium by Flame Photometry – IR (principles) - Infrared spectrophotometer (Block diagram only) –Gravimetry- Estimation of lead – Principle behind column chromatography

TOTAL 60

TEXT BOOKS

1. P. C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Company(P) Ltd., New Delhi , 2006
2. S. S. Dara, Text Book of Engineering Chemistry, S. Chand & Company Ltd., New Delhi, 2003
3. Murthy, Agarwal & Naidu, Text Book of Engineering Chemistry,BSP, 2003
4. S.Sumathi, "Engineering Chemistry I" , Dhanam publications, 2008.

REFERENCES

1. B. K. Sharma, Engineering chemistry, Krishna Prakasam Media (P) Ltd., 2003
2. A I. Vogel, A text book of Qualitative Inorganic Analysis, ELBS, London, 2004
3. A. Gowarikar, Text Book of Polymer Science, 2002
4. Kuriacose & Rajaram, Vols. 1 & 2, Chemistry in Engineering and Technology, 2004

ME 1101 - ENGINEERING GRAPHICS

(Common to All Branches)

L	T	P	C
3	0	3	4

OBJECTIVE

To develop graphic skills for communicating concepts, ideas and designs of engineering products and to give exposure to national standards relating to technical drawings.

Note: Only first angle projection is to be followed

BASICS OF ENGINEERING GRAPHICS **6**

Importance of graphics Use of drawing instruments - BIS conventions and specifications – drawing sheet sizes, layout and folding – lettering – Dimensioning-Geometrical constructions – Scales. Construction of curves like ellipse, parabola, cycloids and involutes.

UNIT - I PROJECTION OF POINTS, LINES AND SURFACES **15**

General principles of presentation of technical drawings as per BIS – Introduction to Orthographic projection - Naming views as per BIS – First angle projection. Projection of points. Projection of straight lines located in first quadrant only. Projection of plane surfaces like polygonal lamina and circular lamina. Drawing views when the surface of the lamina is inclined to one reference plane.

UNIT - II PROJECTION OF SOLIDS **15**

Projections of simple solids like prism, pyramid, cylinder and cone – Drawing views when the axis of the solid is inclined to one reference plane.

UNIT - III SECTION OF SOLIDS AND DEVELOPMENT 15

Sectioning of simple solids like prisms, pyramids, cylinder and cone. Obtaining sectional views and true shape when the axis of the solid is vertical and cutting plane inclined to one reference plane. Development of lateral surfaces of truncated prisms, pyramids, cylinders and cones.

UNIT - IV ORTHOGRAPHIC PROJECTIONS 15

Orthographic projections – Conversion of orthographic views from given pictorial views of objects, including dimensioning. Free hand sketching of Orthographic views from Pictorial views.

UNIT - V PICTORIAL PROJECTIONS 15

Isometric projection – Isometric scale – Isometric views of simple solids like prisms, pyramids, cylinders and cones. Perspective projection of simple solids like cube, prisms and pyramids.

COMPUTER AIDED DRAFTING (Demonstration Only) 9

Introduction to computer aided drafting and dimensioning using appropriate software.

2D drawing commands Zoom, Picture editing commands, Dimensioning, Isometric drawing, Iso-Planes and 3D drafting. Plotting of drawing. Practice includes drawing the projection of lines and solids. Prepare isometric view of simple solids like prisms, pyramids, cylinders and cones.

TOTAL : 90

TEXT BOOKS:

1. Jeyapoovan T, “Engineering Graphics Using AutoCAD“, Vikas Publishing House Pvt Ltd.,New Delhi, 2002
2. Warren J. Luzadder and Jon. M.Duff, “Fundamentals of Engineering Drawing”, Prentice Hall of India Pvt. Ltd., Eleventh Edition, 2001.

REFERENCES

1. N.D.Bhatt and V.M. Panchal, “Engineering Drawing”, Charotar Publishing House, Anand-3 001, 2002
2. Bertoline and Wiebe, Fundamentals of Graphics Communication, Third edition, McGraw-Hill, 2002
3. Thomas E. French, Charles J.Vierck and Robert J.Foster, “ Engineering Drawing and Graphic Technology, McGraw-Hill international Edition.1987
4. Gopalakirishna K.R., “Engineering Drawing (Vol.I&II)”,Subhas Publications, Bangalore,1998.
5. Venugopal K., “Engineering Graphics”, New Age International (P) Limited, New Delhi, 2002.
6. IS 10711 - 2001 Technical Product Documentation - Sizes of drawing sheets
7. IS 9609 - 1983 Lettering on Technical Drawings
8. IS 10714 - 1983 General Principles of Presentation of Technical Drawings
9. IS 11669 - 1986 General Principles of Dimensioning of Technical Drawings

CS1101- COMPUTER PROGRAMMING

(Common to All Branches)

L	T	P	C
3	1	0	4

AIM

- To impart knowledge to analyze, solve, design and code real life problems using C and C++ languages.

OBJECTIVES

- To enable the student to learn the major Components of a Computer System.
- To learn the basic concepts of computing.
- To know the methodology of problem solving.
- To develop skills in programming using C and C++ languages.
- To learn the object oriented concepts.

OUTCOME

The students will be ready to develop programs to solve any kind of problems.

UNIT - I INTRODUCTION TO COMPUTING 12

Introduction and Characteristics of Computers – The Evolution of Computers – The Computer Generations – Classification of Computers – Basic Computer Organization – Number Systems – Computer Arithmetic – Types of Software – Logical System Architecture – Software Development Steps – Planning the program.

UNIT - II INTRODUCTION TO C 12

Overview of C – Constants, Variables and Data Types – Operators and Expression – Managing Input and Output operators – Decision Making and Branching – Decision Making and Looping.

UNIT - III ARRAYS, STRUCTURES AND FUNCTIONS 12

Arrays – Handling of Character Strings – User-Defined data types and user defined functions-Structures–Union–Nested structure, passing structures to functions - Self referential structures.

UNIT - IV POINTERS AND FILE HANDLING 12

Pointer concept–Declaration–Accessing variable through pointer–Initializing pointer variable–Pointers and Functions–Pointers and Arrays–Pointers and Structures–Example programs using pointers with function, arrays and structures–Command line arguments – Dynamic memory allocation–Operations on pointers.

File pointer–High level File operations–Opening and closing of file–Creating, Processing and Updating on files–Random access file-Simple file handling programs.

UNIT - V INTRODUCTION TO OBJECT ORIENTED PROGRAMMING IN C++ 12

Introduction to object oriented paradigm – Merits and demerits of OO Methodology - Classes and Objects - Virtual Functions and Polymorphism and Inheritance - Introduction to Class Access or Methods - Constructors and Destructors - Function overloading and operator overloading - Arrays and String Classes – Inheritance. Simple programs using C++.

TOTAL : 60

TEXT BOOKS

1. ITL Education Solutions Limited, Introduction to Information Technology, Pearson Education Inc. (2005)(Unit I)
2. Byron Gottfried, Programming with C, II edition , TMH Pub.,(2006)(Unit II,III)
3. K.R.Venugopal, T.Ravishankar, Rajkumar, Mastering C++", TMH Pub, (1997)(Unit IV,V)

REFERENCES

1. T.Jeyapoovan, Computer Programming Theory and Practice, Vikas Pub, New Delhi.
2. Herbert Schildt, The Complete Reference C++, McGrawhill Pub.

CS 1131 - COMPUTER PROGRAMMING LABORATORY

(Common to All Branches)

L	T	P	C
0	0	3	1

AIM

To provide an awareness to develop the programming skills using computer languages.

OBJECTIVES

To learn to program in C.

To learn the object oriented basic concepts.

To learn to program in C++.

LIST OF EXPERIMENTS :

PROGRAMMING IN C :

1. To write a C program to prepare the electricity bill.
2. * Functions :

   (a) Call by value (b) Call by reference.

3. To write a C program to print the Fibonacci series for the given number.
4. To write a C program to find the factorial of number using recursion.
5. To write a C program to implement the basic arithmetic operations using Switch Case statement.
6. To write a C program to check whether the given number is an Armstrong number.
7. To write a C program to check whether the given string is a Palindrome.
8. To write a C program to create students details using Structures.
9. To write a C program to demonstrate the Command Line Arguments.
10. To write a C program to implement the Random Access in Files.
11. To write C programs to solve some of the Engineering applications.

PROGRAMMING IN C++

12. To write a C++ program to explain the Stack operation.
13. To write a C++ program to implement the Queue operation.
14. Templates : (a) Function templates. (b) Class templates.
15. Overloading : (a) Operator overloading (b) Function overloading

To write a C++ program using Inheritance concepts.

TOTAL : 45

GE 1101 - ENGINEERING PRACTICES LABORATORY

(Common to All Branches)

L	T	P	C
0	0	3	1

LIST OF EXPERIMENTS

OBJECTIVE

To provide experience to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

1. MECHANICAL ENGINEERING PRACTICE **15**

1. **Welding**

   Preparation of arc welding of butt joints and lap joints

2. **Basic Machining**

   Simple turning and drilling practices using lathe.

3. **Machine assembly practice**

   Study of centrifugal pump

4. **Demonstration on**

a. Smithy operations - Productions of hexagonal headed bolt.

b. Foundry operations - Mould preparation for gear and step cone pulley.

2. CIVIL ENGINEERING **12**

1. Basic pipe connection using valves, couplings, unions, reducers, elbows used in household fitting.
2. Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.
3. Wood work: Sawing, Planning and making common joints.
4. Study of joints in door panels and wooden furniture.

3. ELECTRICAL ENGINEERING **9**

1. Wiring for tube light.
2. Wiring for lamp and fan.
3. Staircase wiring.
4. Study of Iron box and Fan with Regulator.

4. ELECTRONICS ENGINEERING **9**

1. (a) Study of Electronic components and Equipments.
2. Characteristics of PN junction diode & measurement of Ripple factor of half wave and full wave rectifier.
3. Applications of OP-AMP – Inverter, Adder and Subtractor.
4. Study and verification of Logic Gates.

TOTAL : 45

TEXT BOOK

1. T. Jeyapoovan and M.Saravanapandian “Engineering Practices Lab Manual”, 3rd Edition 2006, Vikas Publishing house (P) Ltd., New Delhi.

GE 1102 – PHYSICAL SCIENCES LABORATORY

(Common to All Branches)

L	T	P	C
0	0	3	1

PHYSICS LABORATORY

List of Experiments

1. Torsional Pendulum – Determination of rigidity Modulus of the material of a wire.
2. Non Uniform Bending – Determination of Young's modulus.
3. Viscosity – Determination of co-efficient of Viscosity of a liquid by Poiseuille's flow.
4. Lee's disc – Determination of thermal conductivity of a bad conductor.
5. Air wedge – Determination of thickness of a thin wire.
6. Spectrometer - Refractive index of a prism.
7. Semiconductor laser – Determination of wavelength of Laser using Grating.

CHEMISTRY LABORATORY

List of Experiments

1. Weighing and preparation of standard solutions – Preparation of molar and normal solutions of the following substances – oxalic acid, sodium hydroxide and hydrochloric acid
2. Estimation of Commercial soda by acid-base titration
3. Determination of Percentage of nickel in an alloy
4. Determination of Temporary, permanent and total hardness of water by EDTA method
5. Determination of Chloride content in a water sample
6. Potentiometric Estimation of iron
7. Conductometric Titration of a strong acid with a strong base
8. Determination of Degree of polymerization of a polymer by Viscometry

TOTAL : 45

REFERENCES

1. J.Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas, Vogel's Textbook of Quantative Chemical Analysis, 6th Edition, Pearson Education, 2004.
2. D.P. Shoemaker and C.W. Garland, Experiments in Physical Chemistry, McGraw Hill,London.
3. P.Mani, Engineering Physics Practicals, Dhanam Publications, Chennai, 2005
4. S.Sumathi, Jayalatha, S.Vidya and R.Balaji , Laboratory work book for Engineering Chemistry Practicals, 2007.

SEMESTER – II

EL 1102 – ENGLISH II

L	T	P	C
3	0	1	3

AIM

- To help learners improve their English language skills through a variety of participative learning activities.

OBJECTIVES

- To provide practice in realizing the meaning potential of a text and to make the learners become familiar with different reading strategies
- To help learners acquire interpretative and study skills, including library and Internet reference skills
- To train learners in organized academic and professional writing
- To develop aural competence and oral fluency of learners
- To help learners achieve proficiency in the effective use of language in various authentic career-related situations

UNIT I **9**

Vocabulary Development – Use of reference words, cohesion and coherence – Adjectives – Using present participle and past participle – Punctuation – Antonyms – Single line definition and extended definition – Listening for specific information – non-verbal presentation of ideas – preposition – Expressing suggestions – Informal letters – formal and social letters

Activities Suggested:

Guessing meaning for contexts while reading
Pick out reference words from paragraphs
Order jumbled sentences
Order jumbled paragraphs
Punctuating passages
Fill in blanks using prepositions
Writing letters expressing thanks
Writing complement letters to editor of a newspaper
Writing one sentence definition
Writing extended definition

UNIT II **9**

Vocabulary Development – scanning and study reading – Use of numerical expressions as adjectives – Expressing suggestions – Expressing explanation – Yes/no question formations and discussion – Listening comprehension - Description of things and events.

Activities Suggested:

Matching words with meanings

Formation of words using prefixes and suffixes

Read and answer comprehension questions

Hold short group discussions

Expand numerical expression

Write description of objects and events

Write letters expressing suggestions

Role-plays

UNIT III **9**

Expression of cause and effect – Prepositional phrases – Describing a process – Giving instructions – Design advertisements – Job application with resume – Arguments – Stating a problem and expressing solutions – Listening and making notes – Summary writing.

Activities Suggested:

Making summary of a passage

Listen to instructions and write a description

Combine sentences using connectives to show cause and effect (eg., so as to, because of, as result of etc…)

Design an advertisement for promotion of sale of a particular item

Write an application letter

Prepare a resume

Writing an argument for a cause

Stating solution for a problem

UNIT IV **9**

Present perfect continuous – Use of 'should', 'ought' – Listening to a talk to know the gist - Describing a scenery – Use of as soon as, no sooner than, though, in spite of – Expressing certainty, probability, possibility, impossibility – Use of modal verbs – Use of phrases and idioms – simple past and past perfect – Use of infinitives – Writing memos and circulars- Report writing.

Activities Suggested:

Changing instructions to suggestions

Listening to a talk and write summary

Preparing a travel itinerary

Writing a travelogue

Rewriting sentences using modal verbs

Rewrite sentences using as soon as, no sooner than, though, in spite of etc…

Prepare memos and circulars

Hold discussions and write reports based on the discussions

UNIT V **9**

Meanings of words – Use of conditionals – Expressing futurity – Direct and Indirect speech – Essay writing

Activities Suggested:

Holding interviews

Role-plays

Complete sentences using conditionals

Expressing fears and hopes

Write short essays for given topics

L =45 P=15 TOTAL : 60

TEXT BOOKS

1. Learning to Communicate, A Resource book for Scientists and Technologists – Dr. V. Chellamal., Allied Publishers.
   Units 5 to 10

Extensive Reading : The Monk Who Sold His Ferrari, Robin Sharma., Jaico Publishers.

Note: Extensive reading is not for testing. Regular assignments have to be submitted by the students.

REFERENCES:

1. Farhatullah. T.M. English Practice Book for Engineering Students. Chennai, Emerald Publishers 2000.
2. Joseph KV. A Text Book of English Grammar and Usage. Chennai; Vijay Nickole Imprints Pvt Ltd 2006

MA 1102 – ENGINEERING MATHEMATICS – II

L	T	P	C
3	1	0	4

OBJECTIVES

To impart knowledge on Integrals, Calculus, and Laplace Transformation.

UNIT I MULTIPLE INTEGRALS 9

Double integration – Cartesian and Polar co – ordinates – Change of order of integration – Area as a double integral – Change of variables between Cartesian and Polar Co-ordinates – Triple integration – Volume as a triple integral.

UNIT II VECTOR CALCULUS 9

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proof) – Simple applications.

UNIT III ANALYTIC FUNCTIONS 9

Functions of a complex variable – Analytic function – Necessary conditions – Cauchy – Riemann equations – Sufficient conditions (excluding proof) – Properties of analytic function – Harmonic conjugate – Construction of Analytic functions – Conformal mapping : - w = z + a, az, 1/z and bilinear transformation.

UNIT IV COMPLEX INTEGRATION 9

Statement and application of Cauchy's integral theorem and integral formula – Taylor and Laurent expansions – Isolated singularities – Residues – Cauchy's residue theorem. Contour integration over unit circle and semicircular contours (excluding poles on boundaries) .

UNIT V LAPLACE TRANSFORM 9

Laplace transform – Conditions of existence – Transform of elementary functions – Basic properties - Derivatives and integrals of transforms – Transforms of derivatives and integrals – Initial and final value theorems – Transforms of unit setp function and impulse function – transform of periodic functions.

Inverse Laplace transform – Convolution theorem – Solution of linear ODE of second order with constant coefficient and first order simultaneous equations with constant coefficient using Laplace transform.

TOTAL : 45

TEXT BOOKS:

1. M.K. Venkatraman, Mathematics, Vol – II, National Publishing Company, Chennai.

2. Chandrasekaran. A, Engineering Mathematics, Vol – II, Dhanam Publication, 2008.

REFERENCE:

1. Kandasamy. Engineering Mathematics Volume II, S. Chand & Co., New Delhi.
2. B.S. Grewal , "Engineering Maths – II, Sultem Chand, New Delhi.
3. Bali N.P & Manish Goyal, Text book of Engg. Maths, 3rd Edition, Lakshmi Publications.

PH 1102 ENGINEERING PHYSICS – II

Common to all branches of Engineering & Technology

L	T	P	C
3	1	0	4

AIM

- To enhance student's knowledge of theoretical and modern technological aspects in physics.
- To introduce fundamentals of Science for engineering applications.

OBJECTIVES

At the end of the course the students would be exposed to fundamental knowledge in

- Structure identification of engineering materials.
- Non – destructive techniques.
- Application of quantum physics to electrical phenomena.
- Conducting and Semi conducting materials.
- Modern Engineering materials and Superconducting materials.

UNIT I CRYSTAL PHYSICS AND NON-DESTRUCTIVE TESTING 12

Crystal Physics: Lattice – Unit cell – Bravais Lattice – Lattice planes – Miller indices –'d' spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius - coordination number – Packing factor for SC, BCC, FCC and HCP structures.

Non Destructive Testing : Liquid penetrant method – Ultrasonic flaw detection – Ultrasonic flaw detector (block diagram) – X – ray Radiography; displacement method – Merits and Demerits of each method.

UNIT II QUANTUM PHYSICS 12

Black body radiation – Planck's theory (derivation) – Deduction of W ien's displacement law and Rayleigh – Jeans' law from Planck's theory – Compton effect – Theory and experimental verification – Schroedinger's wave equation – Time independent and time dependent equations –

Physical significance of wave function – Particle in a one dimensional box Extension to 3 dimension (no derivation).

UNIT III CONDUCTING MATERIALS 12

Conduction in metals – Mobility and conductivity – Classical free electron theory of metals – Electrical conductivity – Thermal conductivity – W iedmann Franz law – Lorentz number – Drawbacks of classical theory.

Energy Bands in Solids: Band theory of solids (qualitative) – Classification of solids into metals, semiconductors and insulators on the basis of band theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.

UNIT IV SEMI CONDUCTING MATERIALS 12

Intrinsic Semi-conductors: Carrier concentration in an intrinsic semiconductor – Calculation of density of holes and electrons – Fermi level and its variation with temperature – Mobility and conductivity – Determination of band gap.

Extrinsic Semiconductors: Expression for carrier concentration in n – type and p – type semiconductors – Variation of Fermi level with temperature and impurity concentration - Hall effect determination of Hall coefficient.

UNIT V MODERN ENGINEERING MATERIALS AND SUPERCONDUCTING MATERIALS 12

Modern Engineering Materials:

Metallic glasses: Preparation properties and applications

Shape memory alloys (SMA): Characteristics, applications, advantages and disadvantages of SMA.

Nano Materials: Synthesis – Properties and applications

Superconducting Material: Superconducting phenomena – Properties of superconductors – Meissner effect– Type I and Type II superconductors – High Tc superconductors (qualitative) – uses of superconductors.

TOTAL : 60

TEXT BOOKS:

1. R. K. Gaur and S. L. Gupta “Engineering Physics” Dhanpat Rai Publications, New Delhi, 2003.
2. P. Mani, “Engineering Physics”, Dhanam Publication, Latest Edition
3. P. Charles, Poople and Frank J. Owens, “Introduction to Nanotechnology”, Wiley India, 2007 for Unit V.

REFERENCE

1. Arthur Beiser, “Concepts of Modern Physics”, Tata McGraw-Hill Publications, 2007.
2. Palanisamy P.K., “Physics for Engineers”, Scitech Publications (India) Pvt.Ltd., Chennai, Second Edition.

CY 1102 - ENGINEERING CHEMISTRY - II

(Common to all branches)

L	T	P	C
3	1	0	4

OBJECTIVES

At the end of this course the student should be able to understand various types of corrosion and its control, heat treatment of various alloys, properties of fuels and types of batteries.

UNIT I CORROSION AND ITS CONTROL 12

Definition – Examples – Driving Force – Types of Corrosion – Dry Corrosion and Wet(Electrochemical) Corrosion – Mechanism – Galvanic Corrosion – Concentration Cell Corrosion – Different Types – Galvanic Series – Factors Influencing Corrosion – Metal – Environment – Corrosion Control – Design – Sacrificial Anodic Protection – Impressed Current Cathodic Protection – Protective Coatings – Metallic Coatings – Diffusion Coatings – Non-Metallic Coatings – Paints – Varnish – Lacquers – Enamels

UNIT II ENGINEERING MATERIALS 12

Iron and steel – Alloys – Effects of Alloying – Heat Treatment of Steel – Iron / Carbon Phase Diagram – Properties of Steel – Applications – Polymer Composites – Ceramics – Metal Matrix Composites – Properties – Applications – Lubricants – Mechanism of Lubrication – Classification of Lubricants – Properties – Lubricating Oils – Greases – Semi Solid Lubricants – Solid Lubricants – Mos2 And Graphite – Adhesives – Examples – Properties – Applications – Refractories – Properties – Classification – General Manufacture – Applications – Abrasives – Classification – Properties – Uses.

UNIT III FUELS AND COMBUSTION 12

Fuels – Sources – Calorific Value – Characteristics – Solid, Liquid and Gaseous Fuels – Determination of Calorific Value – Solid and Liquid Fuels – Bomb Calorimeter – Gaseous Fuels – Boy’s Calorimeter – Dulong’s Formula – Problems – Coal – Different Types – Ranking of Coal – Proximate and Ultimate Analysis – Carbonization – Manufacture of Metallurgical Coke – Refining of Petroleum – Cracking – Different Methods – Refining of Gasoline – Reforming – Knocking – Octane Number – Cetane Number – Diesel Index – Natural Gas – Coal Gas – Bio Gas – Producer

Gas –Water Gas – Preparation, Properties and Uses – Combustion – Theoretical Calculation of Air Requirements – Problems – Flue Gas Analysis – Orsat Apparatus.

UNIT IV SPECIALITY MATERIALS 12

Liquid Crystals – Smectic Liquid Crystals – Nematic Liquid Crystals – Cholesteric Liquid Crystals – Disc shaped Liquid Crystal – Polymer Liquid Crystal – Polymorphism in Thermo tropic Liquid Crystal – Molecular arrangement in various states of Liquid Crystal – Super Conductivity – Nanomaterials – Ionic Crystals – Metallic Crystals – Dielectric, Ferro electric, Piezo electric materials – Preparation, Properties and Uses.

UNIT V ENERGY SOURCES 12

Batteries – Primary Cells – Laclanch Cell – Alkaline Battery – Secondary Cell – Nickel Cadmium Battery – Fuel Cells – Hydrogen –Oxygen Fuel Cell – Aluminium Air Battery – Solar Battery – Lead Acid Storage Cell – Nuclear Energy – Mass Defect – Binding Energy – Nuclear Fission – Nuclear Fusion – Breeder Reactors – Advantages, Limitations And Hazards Of Nuclear Reaction – Radiation Dosimetry.

TOTAL : 60

TEXT BOOKS

1. P.C. Jain and Monicka Jain, Engineering Chemistry, Dhanpat Raj Publishing Company (P) Ltd, New Delhi – 2000.
2. S.S. Dara. A Text book of Engineering Chemistry, S. Chand & Company Ltd, New Delhi – 2003.
3. Puri, Sharma and Pathania, Principles of Physical Chemistry, Vishal Publishing Co. Jalandar, 2004.

REFERENCES

1. B.K. Sharma, Engineering Chemistry, Krishna Prakasam Media (P) Ltd., Meerut, 2001.
2. Mars G. Fontana, Corrosion Engineering, Tata McGraw Hill Publishing Co., New Delhi, 2005.
3. Daniel Yesudian, Engineering Chemistry, Hi-Tech Publications, Mayilallllldulthurai, 2002

EE 1105 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to branches under Civil, Mechanical and Technology faculty)

L	T	P	C
3	1	0	4

OBJECTIVES

At the end of this course the student should be able to understand all the basic laws of electrical and electronics engineering.

UNIT I ELECTRICAL CIRCUITS & MEASURMENTS 12

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits.

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS 12

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.

Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

UNIT IV DIGITAL ELECTRONICS 12

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 21

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.

Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL : 60

TEXT BOOKS:

1. V.N. Mittle “Basic Electrical Engineering”,Tata McGraw Hill Edition, New Delhi, 1990.
2. R.S. Sedha, “Applied Electronics” S. Chand & Co., 2006.

REFERENCES:

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, “Basic Electrical, Electronics and Computer Engineering”,Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, “Basics of Electrical Engineering”, Oxford press (2005).
3. Mehta V K, “Principles of Electronics”, S.Chand & Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series, McGraw Hill, (2002).
5 .Premkumar N, “Basic Electrical Engineering”, Anuradha Publications

ME1102 - ENGINEERING MECHANICS
(COMMON TO MECH,AERO,AUTO,CIVIL,EEE & EIE)

L	T	P	C
3	1	0	4

OBJECTIVE

At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

UNIT – I BASICS & STATICS OF PARTICLES 12

Introduction – Units and Dimensions – Laws of Mechanics – Lame’s theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations : addition, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

UNIT – II EQUILIBRIUM OF RIGID BODIES 12

Free body diagram – Types of supports and their reactions – Requirements of stable equilibrium – Static determinacy – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three

dimensions – Examples.

UNIT – III FRICTION 12

Frictional force – Laws of Coulomb friction – Simple contact friction – Belt friction – Transmission of power through belts – Wedge Friction – Screw Jack – Rolling resistance.

UNIT – IV PROPERTIES OF SURFACES AND SOLIDS 12

Determination of Areas and Volumes – Determination of first moment of area , Centroid of sections, Second and product moments of plane area - Rectangle, circle, triangle, T section, I section, Angle section, Hollow section– Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia –Product moment of inertia.

UNIT – V DYNAMICS OF PARTICLES 12

Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

TOTAL : 60

TEXT BOOK:

1. Beer, F.P and Johnson Jr. E.R, "Vector Mechanics for Engineers", Vol. 1 Statics and vol. 2 Dynamics, McGraw-Hill International Edition, 1997.
2. Rajasekaran, S, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt., Ltd., 2003.

REFERENCES :

1. Hibbeller, R.C., Engineering Mechanics, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.
2. Ashok Gupta, Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM), Pearson Education Asia Pvt., Ltd., 2002.
3. Palanichamy, M.S., Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw-Hill, 2001.
4. Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition – Pearson Education Asia Pvt., Ltd., 2003.

AE 1101 - COMPUTER AIDED DRAFTING AND MODELING LAB

L	T	P	C
0	0	3	1

List of Exercises using software capable of Drafting and Modeling

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

TOTAL:60

List of Equipments for a batch of 30 students:

1. Pentium IV computer or better hardware, with suitable graphics facility -30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

SEMESTER III

MA1203 ENGINEERING MATHEMATICS III

L	T	P	C
3	1	0	4

OBJECTIVES

The course objective is to impact analytical skills to the students in the areas of boundary value problems and transform techniques. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT II FOURIER SERIES 12

Drichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's Identity – Harmonic Analysis.

UNIT III BOUNDARY VALUE PROBLEMS 12

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT IV FOURIER TRANSFORM 12

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's Identity.

UNIT V Z –TRANSFORM AND DIFFERENCE EQUATIONS 12

Z-transform – Elementary properties – Inverse Z – transform – Convolution theorem –Formation of difference equations – Solution of difference equations using Z-transform.

TOTAL : 60

TEXT BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.

2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., “Engineering Mathematics Volume III”, S. Chand & Company ltd., New Delhi, 1996.
3. Wylie C. Ray and Barrett Louis, C., “Advanced Engineering Mathematics”, Sixth Edition, McGraw-Hill, Inc., New York, 1995.

REFERENCES

1. Andrews, L.A., and Shivamoggi B.K., “Integral Transforms for Engineers and Applied Mathematicians,” Macmillen , New York ,1981.
2. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., “Advanced Mathematics for Engineering Students”, Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
3. Churchill, R.V. and Brown, J.W., “Fourier Series and Boundary Value Problems”, Fourth Edition, McGraw Hill Book Co., Singapore, 1987.

ME1202 - FLUID MECHANICS AND MACHINERY

L	T	P	C
3	1	0	4

OBJECTIVE

To introduce the behaviour of fluids, kinematics and dynamics of fluids and hydraulic machines

UNIT I BASIC CONCEPTS AND PROPERTIES 6

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.

UNIT II FLIUD KINEMATICS AND FLUID DYNAMICS 12

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms). Equation of streamline - stream function - velocity potential function - circulation - flow net. Fluid dynamics - equations of motion - Euler’s equation along a streamline - Bernoulli’s equation – applications - Venturi meter, Orifice meter, Pitot tube - dimensional analysis - Buckingham’s □ theorem- applications - similarity laws and models.

UNIT III INCOMPRESSIBLE FLUID FLOW 12

Viscous flow - Navier-Stoke's equation (Statement only) - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle's) - Hydraulic and energy gradient - flow through pipes - Darcy -weisback's equation - pipe roughness -friction factor- Moody's diagram-minor losses - flow through pipes in series and in parallel - power transmission - Boundary layer flows, boundary layer thickness, boundary layer separation - drag and lift coefficients.

UNIT IV HYDRAULIC TURBINES 8

Fluid machines: definition and classification - exchange of energy - Euler's equation for turbo machines - Construction of velocity vector diagram's - head and specific work - components of energy transfer - degree of reaction.

Hydro turbines: definition and classifications - Pelton turbine - Francis turbine - propeller turbine - Kaplan turbine - working principles - velocity triangles - work done - specific speed - efficiencies -performance curve for turbines.

UNIT V HYDRAULIC PUMPS 7

Pumps: definition and classifications - Centrifugal pump: Classifications, working principles, velocity triangles, specific speed, efficiency and performance curves. Reciprocating pump: classification, working principles, indicator diagram, work saved by air vessels and performance curves - cavitations in pumps - rotary pumps, working principles of gear and vane pumps

TOTAL : 45

TEXT BOOKS

1. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw-Hill, 1983.
2. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi (7th edition), 1995.
3. Vasandani, V.P., "Hydraulic Machines - Theory and Design", Khanna Publishers, 1992.

REFERENCES

1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (5th edition), Laxmi publications (P) Ltd., New Delhi, 1995.
2. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
3. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 1991.
4. Som, S.K., and Biswas, G., "Introduction to fluid mechanics and fluid machines", Tata McGraw-Hill, 2nd edition, 2004.

AE1201 - AIRCRAFT MATERIALS

L	T	P	C
3	0	0	3

OBJECTIVES

To introduce various materials used in Aerospace industry, their behavior and testing methods

UNIT I MECHANICAL BEHAVIOUR OF ENGINEERING MATERIALS 9

Knowledge of various types of hardness testing machines and various types of hardness numbers Linear and non-linear elastic properties - Stress and Strain Curves – Yielding and strain Hardening ,Toughness – Modules of resilience -– Bauchinger's effect – Effect of notches – Testing and flaw detection of materials and components .

UNIT II MATERIALS IN AIRCRAFT CONSTRUCTION - I 9

Aluminum and its alloys: Types and identification. Properties – Castings – Heat treatment processes – Surface treatments .

Magnesium and its alloys: Cast and Wrought alloys – Aircraft application , features specification, fabrication problems , Special treatments .

Titanium and its alloys: Applications ,machining , forming ,welding and heat treatment .

UNIT III MATERIALS IN AIRCRAFT CONSTRUCTION - II 9

Steels : Plain and low carbon steels , various low alloy steels , aircraft steel specifications ,corrosion and heat resistant steels , structural applications .

Maraging Steels : Properties and Applications

Copper Alloys – Monel , K Monel

Super Alloys : Use – Nickel base – Cobalt base – Iron base – Forging and Casting of Super alloys – Welding , Heat treatment .

UNIT IV ADHESIVE AND SEALANTS FOR AIRCRAFT 9

Advantages of Bonded structure in airframes – Crack arresting – Weight saving – Technology of adhesive Bonding Structural adhesive materials – Test for bonding structure

Typical bonded joints & nondestructive tests for bonded joint

Bonded Sandwich structures - Materials – Methods of construction of honeycombs

UNIT V NON METALS IN AIRCRAFT CONSTRUCTION 9

Wood and fabric in aircraft construction and specifications –Glues

Use of glass ,plastics and rubber in aircraft

Introduction to glass and carbon composite

TOTAL : 45

TEXT BOOKS

1. Aircraft General Engineering by Lalith Gupta, Himalaya Book House, Delhi 2003
2. Workshop Technology – Vol 1 & 2 by Hajira Chowdhry, Nedia Promoters, Mumbai

REFERENCE

1. Aircraft Material & Process by Titterton 2004
2. Advanced Composite Materials by Lalith Gupta 2006, Himalaya Book House, Delhi

AE1202 - AERO ENGINEERING THERMODYNAMICS

L	T	P	C
3	1	0	4

OBJECTIVE

To give a brief background of application of various laws of thermodynamics and its application in heat transfer, refrigeration and air-conditioning, jet propulsion system.

UNIT I BASIC THERMODYNAMICS 12

Systems, Zeroth Law, First Law - Heat and work transfer in flow and non-flow processes, Second law, Kelvin- Planck statement - Clausius statement - concept of entropy - Clausius inequality - entropy change in non-flow processes.

UNIT II AIR CYCLES 12

Otto, Diesel, Dual combustion and Brayton combustion cycles – Air standard efficiency - Mean effective pressure – Actual and theoretical PV diagrams of four stroke and two stroke IC Engines.

UNIT III THERMODYNAMICS OF ONE DIMENSIONAL FLUID FLOW 12

Application of Continuity and energy equations- Properties of steam - Rankine cycle - Isentropic flow of ideal gases through nozzles - Simple jet propulsion system - Thrust rocket motor – Specific impulse.

UNIT IV REFRIGERATION AND AIR CONDITIONING 12

Principles of refrigeration, Air conditioning - Heat pumps - Vapour compression - Vapour absorption types - Coefficient of performance, Properties of refrigerants.

UNIT V AIR COMPRESSORS 12

Classification and working principle, work of compression with and without clearance, Isothermal and Isentropic efficiency of reciprocating air compressors, multistage compression and intercooling.

Various types of compressors (Descriptive treatment only)

TOTAL : 60

TEXT BOOKS

1. Rathakrishnan, E, “Fundamentals of Engineering Thermodynamics”, Prentice – Hall, India, 2000
2. Nag. P.K., “Engineering Thermodynamics”, Tata McGraw-Hills Co., Ltd., Seventh Edn., 1993
3. Yunus A.Cengal. “Thermodynamics an Engineering Approach”, Tata McGraw-Hill Co. Ltd., 3rd Edition, 2002.

REFERENCES

1. Mayhew, A. and Rogers, B., “Engineering Thermodynamics”, Longman Green & Co. Ltd., London, E.L.B.S. Edition, 1990.
2. Van Wylen, G.J. and Sonntag, R.E., “Fundamentals of Classical Thermodynamics (S.I. Version)”, Second Edition, 1986.
3. Bacon, D.H., “Engineering Thermodynamics”, Butterworth & Co., London, 1989.
4. Saad, M.A., “Thermodynamics for Engineers”, Prentice-Hall of India Pvt. Ltd., 1989.
5. Reynolds, “Thermodynamics”, Int. Student Edn., McGraw-Hill Book Co., Ltd., 1990

AE1203 - SOLID MECHANICS

L	T	P	C
3	1	0	4

OBJECTIVE

To give brief descriptions on the behaviour of materials due to axial, bending, torsional and combined loads.

UNIT I BASICS AND AXIAL LOADING 12

Stress and Strain – Hooke’s Law – Elastic constants and their relationship– Statically determinate cases - bar with uniform and varying section statically indeterminate cases –composite bar. Thermal Stresses – stresses due to freely falling weight.

UNIT II STRESSES IN BEAMS 12

Shear force and bending moment diagrams for simply supported and cantilever beams – Bending stresses in straight beams – Shear Stresses in bending of beams with various cross sections – beams of uniform strength

UNIT III DEFLECTION OF BEAMS 12

Double integration method – McCauley’s method - Area moment method – Conjugate beam method.

UNIT IV TORSION 12

Torsion of circular shafts - shear stresses and twist in solid and hollow circular shafts – closely coiled helical springs.

UNIT V BI AXIAL STRESSES 12

Stresses in thin circular cylinder and spherical shell under internal pressure, volumetric Strain. Combined loading, Principal Stresses and maximum Shear Stresses - Analytical and Graphical methods.

TOTAL : 60

TEXT BOOKS

1. Nash William – "Strength of Materials", TMH, 1991
2. Timoshenko.S. and Young D.H. – "Elements of strength materials Vol. I and Vol. II"., T. Van Nostrand Co-Inc Princeton-N.J. 1990.

REFERENCES

1. Dym C.L. and Shames I.H. – "Solid Mechanics", 1990.

AE1204 - ELEMENTS OF AERONAUTICS

L	T	P	C
3	0	0	3

OBJECTIVE

To introduce the basic concepts of aerospace engineering and the current developments in the field.

UNIT I HISTORICAL EVALUATION 8

Early airplanes, biplanes and monoplanes, Developments in aerodynamics, materials, structures and propulsion over the years.

UNIT II AIRCRAFT CONFIGURATIONS 5

Components of an airplane and their functions. Different types of flight vehicles, classifications. Conventional control, Powered control, Basic instruments for flying, Typical systems for control actuation.

UNIT III INTRODUCTION TO PRINCIPLES OF FLIGHT 10

Physical properties and structure of the atmosphere, Temperature, pressure and altitude relationships, Evolution of lift, drag and moment. Aerofoils, Mach number, Maneuvers.

UNIT IV INTRODUCTION TO AIRPLANE STRUCTURES 12

General types of construction, Monocoque, semi-monocoque and geodesic construction, Typical wing and fuselage structure. Landing Gear Structure

UNIT V POWER PLANTS USED IN AIRPLANES 10

Basic ideas about piston, turboprop and jet engines, Use of propeller and jets for thrust production. Comparative merits, Principles of operation of rocket, types of rockets and typical applications, Exploration into space.

TOTAL : 45

TEXT BOOKS

1. Anderson, J.D., "Introduction to Flight", McGraw-Hill, 1995.

REFERENCE

1. Kermode, A.C., "Flight without Formulae", McGraw-Hill, 1997.

AE1205 - STRENGTH OF MATERIALS LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVE

To develop the knowledge in testing the materials for hardness, fatigue, impact, tension and torsion.

LIST OF EXPERIMENTS

1. Hardness test - a)Vickers b)Brinell c) Rockwell d) Shore
2. Tension test
3. Torsion test
4. Impact test – a) Izod b)Charpy c) Drop Test.
5. Fatigue test - a) Reverse plate bending b) Rotating Beam
6. Testing of springs
7. Block Compression Test

TOTAL : 60

LIST OF EQUIPMENTS

(for a batch of 30 students)

Sl.No	Details of Equipments	Qty Required	For Experiments
1.	Vickers Hardness Testing Machine	1	1
2.	Brinell Hardness Testing Machine	1	1
3.	Rockwell Hardness Testing Machine	1	1
4.	Shore Hardness Testing Machine	1	1
5.	Universal Testing Machine	1	2,3,7
6.	Izod Impact Testing Machine	1	4
7.	Charpy Impact Testing Machine	1	4
8.	Fatigue tester- Rotating Beam	1	5
9.	Fatigue tester –Reverse plate bending	1	5

AE1206 - DESIGN AND DRAFTING LAB

L	T	P	C
0	0	3	1

OBJECTIVE

To introduce the concept of design of basic structural components and to draft both manually and using modelling package.

LIST OF EXERCISES

1. Design of riveted joints (Lap joint).
2. Design of riveted joints (Butt joint with single and double straps).
3. Design of welded joints.
4. Layout of typical wing structure.
5. Layout of typical fuselage structure.
6. Computer aided modeling of typical aircraft wing.
7. Computer aided modeling of typical fuselage structure.
8. Computer aided modeling of landing gear
9. Three view diagram of a typical aircraft
10. Layout of control systems

TOTAL : 60

LIST OF EQUIPMENT

(for a batch of 30 students)

Sl.No	Equipments	Quantity	Experiments No.
1	Drawing Boards, Drafting machines	30	1 - 5
2.	Computer and modeling software	Pentium IV PC's,	30 Nos.
3.	License of Software	30	6 - 10

AE1207 - THERMODYNAMICS LAB

L	T	P	C
3	1	0	4

OBJECTIVE

To enhance the basic knowledge in applied thermodynamics

LIST OF EXPERIMENTS

1. Performance test on a 4-stroke engine
2. Valve timing of a 4 – stroke engine and port timing of a 2 stroke engine
3. Determination of effectiveness of a parallel flow heat exchanger
4. Determination of effectiveness of a counter flow heat exchanger
5. Determination of the viscosity coefficient of a given liquid
6. COP test on a vapour compression refrigeration test rig
7. COP test on a vapour compression air-conditioning test rig
8. Study of a Gas Turbine Engine.
9. Determination of Conductive Heat Transfer Coefficient.
10. Determination of Thermal Resistance of a Composite wall.

TOTAL : 60

LIST OF EQUIPMENTS

(for a batch of 30 students)

Sl.No	Details of Equipments	Qty Req.	Experiment No.
1.	4 stroke twin cylinder diesel engine	1	1
2.	Cut section model of 4 stroke kirloskar diesel engine and cut section model of 2 stroke petrol engine	1	2
3.	Parallel and counter flow heat exchanger test rig	1	3,4
4.	Red wood viscometer	1	5
5.	Vapour compression refrigeration test rig	1	6
6.	Vapour compression air-conditioning test rig	1	7
7.	Gas Turbine Engine	1	8
1.	Conductive Heat Transfer set up	1	9
9.	Composite wall	1	10

SEMESTER IV

MA1204 - NUMERICAL METHODS

L	T	P	C
3	1	0	4

OBJECTIVES

With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving numerically different kinds of problems in engineering. At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses.

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 12

Linear interpolation methods (method of false position) – Newton's method – Statement of Fixed Point Theorem – Fixed pointer iteration x=g(x) method – Solution of linear system of Gaussian elimination and Gauss-Jordan methods – Iterative methods: Gauss Jacobi and Gauss – Seidel methods- Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by power methods.

UNIT II INTERPOLATION AND APPROXIMATION 12

Lagrangian Polynomials – Divided difference – Interpolation with a cubic spline – Newton forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Derivatives from difference table – Divided difference and finite difference – Numerical integration by Trapezoidal and Simpson's 1/3 and 3/1 rules – Romberg's method – Two and three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single step Methods : Taylor Series and methods - Euler and Modified Euler methods - Fourth order Runge-Kutta method for solving first and second order equations - Multistep methods – Milne's and Adam's predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS 12

Finite difference solution for the second order ordinary differential equations. Finite difference solution for one dimensional heat equation by implict and explict methods – one dimensional wave equation and two dimensional Laplace and Poisson equations.

TOTAL : 60

TEXT BOOKS :

1. M.K. Venkataraman, “Numerical Methods”, Natiuonal Publishing Company, Latest Edition.
2. S. Arumugam, “Numerical Methods for Engineers”,
3. Haribaskaran, “Numerical Methods”, Laxmi Publications. Latest Editions.

REFERENCES :

1. A. Singaravelu, “Numerical Methods”, Meenakshi Publications, Latest Edition
2. Kandasamy, “Numerical Methods”, S. Chand & Co., New Delhi.

AT 1204 - MECHANICS OF MACHINES

L	T	P	C
3	1	0	4

OBJECTIVE

To expose the students the different mechanisms, their method of working, Forces involved and consequent vibration during working

UNIT I MECHANISMS 12

Machine Structure – Kinematic link, pair and chain – Grueblers criteria – Constrained motion – Degrees of freedom - Slider crank and crank rocker mechanisms – Inversions – Applications – Kinematic analysis of simple mechanisms – Determination of velocity and acceleration.

UNIT II FRICTION 12

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 12

Gear profile and geometry – Nomenclature of spur and helical gears – Gear trains: Simple, compound gear trains and epicylic 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 BALANCING 12

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

UNIT V VIBRATION 12

Free, forced and damped vibrations of single degree of freedom systems – Force transmitted to supports – Vibration isolation – Vibration absorption – Torsional vibration of shaft – Single and multi rotor systems – Geared shafts – Critical speed of shaft.

TOTAL : 60

TEXT BOOKS

1. Rattan.S.S, "Theory of Machines", Tata McGraw–Hill Publishing Co, New Delhi, 2004.
2. Ballaney.P.L, "Theory of Machines", Khanna Publishers, New Delhi, 2002.

REFERENCES

1. Rao, J.S and Dukkipati, R.V, "Mechanism and Machine Theory", Second Edition, Wiley Eastern Ltd., 1992.
2. Malhotra, D.R and Gupta, H.C., "The Theory of Machines", Satya Prakasam, Tech. India Publications, 1989.
3. Gosh, A. and Mallick, A.K., "Theory of Machines and Mechanisms", Affiliated East West Press, 1989.
4. Shigley, J.E. and Uicker, J.J., "Theory of Machines and Mechanisms", McGraw-Hill, 1980. Burton Paul, "Kinematics and Dynamic of Planer Machinery", Prentice Hall, 1979.

AE1208 - AERODYNAMICS – I

L	T	P	C
3	1	0	4

OBJECTIVE

To understand the behaviour of airflow over bodies with particular emphasis on airfoil sections in the incompressible flow regime.

UNIT I REVIEW OF BASIC FLUID MECHANICS 6

Continuity, momentum and energy equations.

UNIT II TWO DIMENSIONAL FLOWS 14

Basic flows – Source, Sink, Free and Forced vortex, uniform parallel flow. Their combinations, Pressure and velocity distributions on bodies with and without circulation in ideal and real fluid flows. Kutta Joukowski's theorem.

UNIT III CONFORMAL TRANSFORMATION 12

Joukowski transformation and its application to fluid flow problems, Kutta condition, Blasius theorem.

UNIT IV AIRFOIL AND WING THEORY 14

Joukowski, Karman - Trefftz, Profiles - Thin aerofoil theory and its applications. Vortex line, Horse shoe vortex, Biot and Savart law, Lifting line theory and its limitations.

UNIT V VISCOUS FLOW 14

Newton's law of viscosity, Boundary Layer, Navier-Stokes equation, displacement, Momentum thickness, Flow over a flat plate, Blasins solution.

TOTAL : 60

TEXT BOOKS

1. Anderson, J.D., "Fundamentals of Aerodynamics", McGraw-Hill Book Co., New York, 1985.

REFERENCES

1. Houghton, E.L., and Carruthers, N.B., "Aerodynamics for Engineering students", Edward Arnold Publishers Ltd., London, 1989.
2. Milne Thomson, L.H., "Theoretical aerodynamics", Macmillan, 1985.
3. Clancey, L.J., "Aerodynamics", Pitman, 1986

AE1209 - AIRCRAFT SYSTEMS AND INSTRUMENTATIONS

L	T	P	C
3	0	0	3

OBJECTIVE

To describe the principle and working of aircraft systems and instruments

UNIT I AIRPLANE CONTROL SYSTEMS 10

Conventional Systems - Power assisted and fully powered flight controls - Power actuated systems – Engine control systems - Push pull rod system, flexible push pull rod system - Components - Modern control systems - Digital fly by wire systems - Auto pilot system active control Technology, Communication and Navigation systems Instrument landing systems, VOR - CCV case studies.

UNIT II AIRCRAFT SYSTEMS 10

Hydraulic systems - Study of typical workable system - components - Hydraulic system controllers - Modes of operation - Pneumatic systems - Advantages - Working principles - Typical Air pressure system – Brake system - Typical Pneumatic power system - Components, Landing Gear systems - Classification – Shock absorbers - Retractive mechanism.

UNIT III ENGINE SYSTEMS 8

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 AUXILLIARY SYSTEM 8

Basic Air cycle systems - Vapour Cycle systems, Boost-Strap air cycle system - Evaporative vapour cycle systems - Evaporative air cycle systems - Oxygen systems - Fire protection systems, Deicing and anti icing systems.

UNIT V AIRCRAFT INSTRUMENTS 9

Flight Instruments and Navigation Instruments – Gyroscope - Accelerometers, Air speed Indicators – TAS, EAS- Mach Meters - Altimeters - Principles and operation - Study of various types of engine instruments - Tachometers - Temperature gauges - Pressure gauges - Operation and Principles.

TOTAL : 45

TEXT BOOKS

1. McKinley, J.L., and Bent, R.D., “Aircraft Maintenance & Repair”, McGraw-Hill, 1993.
2. “General Hand Books of Airframe and Powerplant Mechanics”, U.S. Dept. of Transportation, Federal Aviation Administation, The English Book Store, New Delhi1995.

REFERENCES

1. Mekinley, J.L. and Bent, R.D., “Aircraft Power Plants”, McGraw-Hill, 1993.
2. Pallet, E.H.J., “Aircraft Instruments & Principles”, Pitman & Co., 1993.
3. Treager, S., “Gas Turbine Technology”, McGraw-Hill, 1997.

AE1210 - AIRCRAFT STRUCTURES – I

L T P C

3 1 0 4

OBJECTIVE

To study different types of beams and columns subjected to various types of loading and support conditions with particular emphasis on aircraft structural components.

UNIT I STATICALLY DETERMINATE STRUCTURES 12

Analysis of plane truss – Method of joints – 3 D Truss - Plane frames

UNIT II STATICALLY INDETERMINATE STRUCTURES 12

Composite beam - Clapeyron's Three Moment Equation - Moment Distribution Method.

UNIT III ENERGY METHODS 12

Strain Energy due to axial, bending and Torsional loads - Castigliano's theorem - Maxwell's Reciprocal theorem, Unit load method - application to beams, trusses, frames, rings, etc.

UNIT IV COLUMNS 12

Columns with various end conditions – Euler's Column curve – Rankine's formula - Column with initial curvature - Eccentric loading – South well plot – Beam column.

UNIT V FAILURE THEORY 12

Maximum Stress theory – Maximum Strain Theory – Maximum Shear Stress Theory – Distortion Theory – Maximum Strain energy theory – Application to aircraft Structural problems.

TOTAL : 60

TEXT BOOK

1. Donaldson, B.K., "Analysis of Aircraft Structures – An Introduction", McGraw-Hill, 1993.

REFERENCE

1. Timoshenko, S., "Strength of Materials", Vol. I and II, Princeton D. Von Nostrand Co, 1990.

AE1211 - CONTROL ENGINEERING

L T P C

3 0 0 3

OBJECTIVE

To understand the basic concepts of flight control system.

UNIT I INTRODUCTION 6

Historical review - Simple pneumatic, hydraulic and thermal systems, Series and parallel systems, Analogies - Mechanical and electrical components, Development of flight control systems.

UNIT II OPEN AND CLOSED LOOP SYSTEMS 6

Feedback control systems – Block diagram representation of control systems, Reduction of block diagrams, Output to input ratios, Signal flow graph.

UNIT III CHARACTERISTIC EQUATION AND FUNCTIONS 10

Lap lace transformation, Response of systems to different inputs viz., Step input, impulse, ramp, parabolic and sinusoidal inputs, Time response of first and second order systems, steady state errors and error constants of unity feedback circuit.

UNIT IV CONCEPT OF STABILITY 15

Necessary and sufficient conditions, Routh – Hurwitz criteria of stability, Root locus and Bode techniques, Concept and construction, frequency response.

UNIT V SAMPLED DATA SYSTEMS 8

Introduction to digital control system, Digital Controllers and Digital PID Controllers.

TOTAL : 45

TEXT BOOKS

1. OGATO, “Modern Control Engineering”, Prentice – Hall of India Pvt. Ltd. New Delhi, 1991.
2. GOPAL.M. “Control Systems, Principles and design” – Tata McGraw-Hill Publication, New Delhi, 2000.

REFERENCES

1. Azzo, J.J.D. and C.H. Houpis, “Feed back control system analysis and synthesis”, McGraw – Hill International, 3rd Edition, 1998.
2. Kuo, B.C., “Automatic control systems”, Prentice – Hall of India Pvt. Ltd., New Delhi, 1998.
3. Houpis, C.H. and Lamont, G.B., “Digital Control Systems”, McGraw-Hill Book Co. New York, USA 1995.
4. Naresh K. Sinha, “Control Systems”, New Age International Publishers, New Delhi

AE1212 - AIRCRAFT STRUCTURES LAB – I

L T P C

0 0 3 1

OBJECTIVE

To study experimentally the load deflection characteristics structural materials under different types of loads.

LIST OF EXPERIMENTS

1. Determination of Young's modulus of steel using mechanical extensometers.
2. Determination of Young's modulus of aluminum using electrical extensometers
3. Determination of fracture strength and fracture pattern of ductile materials
4. Determination of fracture strength and fracture pattern of brittle materials
5. Stress Strain curve for various engineering materials.
6. Deflection of beams with various end conditions.
7. Verification of Maxwell's Reciprocal theorem & principle of superposition
8. Column – Testing
9. South – well's plot.
10. Riveted Joints.

TOTAL : 60

LIST OF EQUIPMENTS

(for a batch of 30 students)

Sl. No.	Equipments	Qty	Experiments No.
1.	Universal Testing Machine	1	1,2,3,4,5,10
2.	Mechanical Extensometer	1	1
3.	Electrical stain gauge	10	2
4.	Stain indicator	1	2,5
5.	Dial Gauges	12	3,4
6.	Beam Test set up with various end conditions	2	6,7
7.	Weight 1 Kg	10	6,7
1.	Weight 2 Kg	10	6.7.8
9.	Weight Pans	6	6,7,8
10.	Column Test Apparatus	1	5,6.7,8
11.	Rivet	30	10

AE1213 - FLUID MECHANICS AND MACHINERY LAB

L T P C

0 0 3 1

OBJECTIVE

To study the flow measurement and the performance of fluid machinery

LIST OF EXPERIMENTS

1. Calibration of venturimeter
2. Pressure measurement with pitot static tube
3. Determination of pipe flow losses.
4. Verification of Bernoulli's theorem
5. Flow visualization by Heleshaw apparatus
6. Performance test on centrifugal pumps
7. Performance test on reciprocating pumps
8. Performance test on pelton wheel turbine
9. Performance test on Francis turbine
10. Determination of Viscosity of a Fluid

TOTAL : 60

LIST OF EQUIPMENTS

(for a batch of 30 students)

Sl.No	Details of Equipments	Qty Req.	Experiment No.
1.	Venturimeter setup	1	1,3
2.	Pipe friction set up	1	3
3.	Pitot tube set up	1	2,4
4.	Jet pump	1	6
5.	Submersible pump	1	6
6.	Centrifugal pump	1	6
7.	Reciprocating pump	1	7
8.	Pelton wheel turbine and Francis turbine	1	8,9
9.	Viscosity Meter	1	10
10.	Hele-shaw apparatus	1	5

AE1214 - AERODYNAMICS LAB

L T P C

0 0 3 1

OBJECTIVE

To study experimentally the aerodynamic forces on different bodies at low speeds.

LIST OF EXPERIMENTS

1. Calibration of subsonic wind tunnel.
2. Pressure distribution over smooth and rough cylinder.
3. Pressure distribution over symmetric airfoil.
4. Pressure distribution over cambered airfoil & thin airfoils
5. Force measurement using wind tunnel balance.
6. Flow over a flat plate at different angles of incidence
7. Flow visualization studies in low speed flow over cylinders
8. Flow visualization studies in low speed flow over airfoil with different angle of incidence
9. Calibration of supersonic wind tunnel.
10. Supersonic flow visualization with Schlieren system.

TOTAL : 60

LIST OF EQUIPMENT

(for a batch of 30 students)

Sl.No.	Items	Quantity	Experiment No.
1.	Wind Tunnel test section size around 300 x 300 mm with test section flow speed of 70 m/s.	1 No.	1, 2,3,4,5
2.	Wings of various airfoil sections (Symmetrical & cambered airfoils)	2 Nos. each	3, 4
3.	Angle of incidence changing mechanism	1 No.	3, 4
4.	Multiple Manometer stands with 20 – 30 manometer tubes	4 Nos.	2,3,4
5.	U-Tube Manometer	1 No.	1,2,3,4
6.	Static Pressure Probes	4 Nos.	1,2,3,4
7.	Total Pressure Probest	4 Nos.	1,2,3,4
8.	Pitot-Static Tubes	4 Nos.	1,2,3,4
9.	Wooden Models of Three Dimensional bodies (eg. Cylinder etc.,)	2 Nos. each	2
10.	Wind Tunnel balances (3 or 5 or 6 components)	1 No.	5
11.	Pressure Transducers with digital display	1 No.	1,2,3,4

12.	Hele-Shaw apparatus, Smoke Tunnel, Water flow channel	1 each	6,7,8
13.	Supersonic Wind tunnel of test section size 100 x 100 mm with storage tank capacity of 500ft2 at 20 bar	1 No.	9,10
14.	Wooden models of cone, wedge and blunt body configurations of suitable size for flow visualization in a supersonic wind tunnel test section	1 No.	9,10
15.	Schlieren System	1 No.	9,10

SEMESTER V

EC 1319 - MICROPROCESSORS AND APPLICATIONS

L	T	P	C
3	0	0	3

OBJECTIVE

To give the principle and applications of microprocessor to the students

UNIT I SEMICONDUCTOR DEVICES 12

PN Junction diodes – Zenor Diodes – Tunnels Diodes- Thermistors – Transistors – FET and MOSFET – Silicon Controlled Rectifiers And Triacs – their Applications – Half Wave and Full Wave Rectifiers – Filters – Ripple Factor – Zenor Regulators and AC Voltage Regulators – Principles and Types of Transistor Amplifiers – RC Coupled, Transformer Coupled, Direct Coupled – Multistage, FET and Power Amplifers.

UNIT II LINEAR AND DIGITAL ICS 10

IC Technology – Elements of Fabrication of Linear and Digital IC's – D/A and A/D Converters –Comparison Between Analog and Digital Systems – Number Representation – Binary, Octal and Hexadecimal Number Systems – Logic Families and Logic Gates – Flip – Flops – Multi Vibrations Using IC's – Half and full Adder – Registers – Counters – Multiplexers- Demultiplexers – Decoders – Encoders.

UNIT III MICROPROCESSORS 10

Block Diagram of Microprocessors – Architecture of Intel 8085 – Importance of Data, Address and Control Buses – Instruction Formats – Addressing Modes and Types of Intel 8015 – Instruction Set For 8085 – Development of Simple Language Assembly Programs – Architecture and Functioning of Processors like Z80, M6800 and Intel Family of 80 X 86 Processors.

UNIT IV MICROPROCESSOR MEMORY DEVICES 8

RAM, ROM, EPROM – magnetic Bubble Memory – Floppy and Hard Disc – Interfacing of Memory Chips – CRT Terminals – Printers, Keyboards and their Interfacing – Parallel and Series Communication – Synchronous and Asynchronous Data Transfer – DMA Data Transfer.

UNIT V APPLICATIONS 5

Microprocessor Applications in aerospace – Case study.

TOTAL : 45

TEXT BOOKS

1. "Computer principles of architecture", Tata McGraw-Hill, New Delhi. 4th Edition 2002.
2. Goankar. R.S., "Microprocessors, Programming to Architecture 8085", Penram International publishing PVT Ltd, New Delhi. 5th Edition 2002
3. V.K. Mehta, "Principles of Electronics", S. Chand & Co, New Delhi, 2nd Edition 2002

REFERENCES

1. Malvino A.P. Leach, D.P., "Digital Principles & Applications", Tata McGraw– Hill, 1990.
2. Goankar R.S., "Microprocessors Architecture. Programming and Applications", Wiley Eastern, 1992.
3. Ajit Pal., "Microprocessors", Tata McGraw-Hill, Revised Edition 1995.
4. Douglas, Hall, "Microprocessors and Interfacing", Tata McGraw–Hill, Revised Edition 1990.
5. Mathur A.P., "Introduction to Microprocessors", Tata McGraw–Hill, Revised Edition 1995.

AE 1301 - CIVIL AVIATION REQUIREMENTS - I

L	T	P	C
3	0	0	3

OBJECTIVE

To impart knowledge regarding CAR in India (DGCA) in par with FAA & JAA

UNIT I INDIAN AIRCRAFT RULES 1937 AND RELATED PUBLICATIONS 4

Knowledge of aircraft act, 1934, aircraft rules, 1937 as far as they related to airworthiness and safety of aircraft. Knowledge of civil airworthiness requirements, aeronautical information circulars, aeronautical information publications- (relating to airworthiness), advisory circulars & A.M.E. notices (NOTAMS) by DGCA.

UNIT II C.A.R. SERIES " A " & " B " 8

C.A.R. series A – procedure for issue of civil airworthiness requirements and responsibility of operators vis-à-vis air worthiness directorate:

Responsibilities of operators/owners; procedure of CAR issue, amendments etc; objectives and targets of airworthiness directorate; airworthiness regulations and safety oversight of engineering activities of operations

C.A.R. series "B" – issue approval of cockpit check list, MEL, CDL:

Deficiency list (MEL & CDL); preparation and use of cockpit check list and emergency check list.

UNIT III C.A.R. SERIES "C" 8

C.A.R. series 'C' – defect recording, monitoring, investigation and reporting: Defect recording, reporting, investigation, rectification and analysis; flight report, recording of in-flight instrument, reading and reporting of flight defects and rectification of defects observed on aircraft.

C.A.R. series 'D – and aircraft maintenance programmes:

Reliability programmes (engines); aircraft maintenance programmes & their approval: on condition maintenance of reciprocating engines; TBO – revision programme.

UNIT IV C.A.R. SERIES " E" 10

C.A.R. Series E – approval of organizations:

Approval of organizations in categories A, B, C, D, E, F, & G; requirements of infrastructure at stations other than parent base.

UNIT V C.A.R. SERIES " F " 15

C.A.R. Series "F" airworthiness and continued airworthiness:

Procedure relating to registration of aircraft; procedure for issue / revalidation of type certification of aircraft and its engines / propellers; issue /revalidation and renewal of certificate of airworthiness; require for renewal of certificate of airworthiness. Suspensions of certificate of airworthiness and its subsequent revalidation; rebuilding of aircraft, continuous airworthiness maintenance programme; airworthiness of ageing aircraft; control system–duplicate inspection,Inspection of wooden aircraft; airworthiness requirements of gliders, requirements of manufacture , registration & airworthiness control of hot air balloons; approval of flight manuals and their amendments ; pooling of aircraft parts by national airlines of India with foreign airlines construction, certification and operation of experimental / amateur built aircraft; manufacture of aircraft and accessories and airworthiness certification thereof; age of aircraft to be imported for charter hire " air taxi and other operations", import/export of aircraft, item of equipment etc . For use on aircraft; load and trim sheet – requirements thereof.

TOTAL : 45

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.

2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Aircraft manual (India) volume – latest edition, the English book store, 17-l, Connaught circus, New Delhi.
2. Civil aviation requirements with latest amendment (section 2 airworthiness) – published by DGCA, the English book store, 17-l, Connaught circus, New Delhi.
3. Aeronautical information circulars (relating to airworthiness) from DGCA.
4. Advisory circulars from DGCA.
5. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available).
6. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
7. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
8. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.

AE1302 - FLIGHT DYNAMICS

L	T	P	C
3	1	0	4

OBJECTIVE

To study the performance of airplanes under various operating conditions and the static and dynamic response of aircraft for both voluntary and involuntary changes in flight conditions

UNIT I DRAG ON THE AIRPLANE 12

International Standard Atmosphere - Forces and moments acting on a flight vehicle - Equation of motion of a rigid flight vehicle - Different types of drag - Drag polars of vehicles from low speed to high speed - Variation of thrust, power and SFC with velocity and altitudes for air breathing engines and rockets - Power available and power required curves.

UNIT II AIRCRAFT PERFORMANCE 15

Performance of airplane in level flight - Maximum speed in level flight - Conditions for minimum drag and power required - Range and endurance - Climbing and gliding flight (Maximum rate of

climb and steepest angle of climb, minimum rate of sink and shallowest angle of glide) -Turning performance (Turning rate, turn radius). Bank angle and load factor - Limitations of pull up and push over - V-n diagram and load factor.

UNIT III STATIC LONGITUDINAL STABILITY 15

Degree of freedom of rigid bodies in space - Static and dynamic stability - Purpose of controls in airplanes -Inherently stable and marginal stable airplanes – Static Longitudinal stability - Stick fixed stability - Basic equilibrium equation - Stability criterion - Effects of fuselage and nacelle - Influence of CG location - Power effects - Stick fixed neutral point - Stick free stability-Hinge moment coefficient - Stick free neutral points-Symmetric maneuvers - Stick force gradients - Stick force per 'g' - Aerodynamic balancing. Determination of neutral points and maneuver points from flight test.

UNIT IV LATERAL AND DIRECTIONAL STABILITY 8

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.

UNIT V DYNAMIC STABILITY 10

Dynamic longitudinal stability: Equations of motion - Stability derivatives - Characteristic equation of stick fixed case - Modes and stability criterion - Effect of freeing-the stick - Brief description of lateral and directional. Dynamic stability - Spiral, divergence, Dutch roll, auto rotation and spin.

TOTAL : 60

TEXT BOOK

1. Perkins, C.D., and Hage, R.E., "Airplane Performance stability and Control", John Wiley & Son:, Inc, New York, 1911.

REFERENCES

1. Etkin, B., "Dynamics of Flight Stability and Control", Edn. 2, John Wiley, New York, 1912.
2. Babister, A.W., "Aircraft Dynamic Stability and Re¬sponse", Pergamon Press, Oxford, 1910.
3. Dommasch, D.O., Shelby, S.S., and Connolly, T.F., "Aeroplane Aero dynamics", Third Edition, Issac Pitman, London, 1911.
4. Nelson, R.C. "Flight Stability and Automatic Control", McGraw-Hill Book Co., 1991.

AE1303 - AIRCRAFT STRUCTURES – II

L	T	P	C
3	1	0	4

OBJECTIVE

To study the behaviour of various aircraft structural components under different types of loads.

UNIT I UNSYMMETRICAL BENDING 12

Bending stresses in beams of unsymmetrical sections – Bending of symmetric sections with skew loads.

UNIT II SHEAR FLOW IN OPEN SECTIONS 12

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 12

Bredt – Batho formula, Single and multi cell structures. Approximate methods. Shear flow in single & multi cell structures under torsion. Shear flow in single and multicell under bending with walls effective and ineffective.

UNIT IV BUCKLING OF PLATES 12

Rectangular sheets under compression, Local buckling stress of thin walled sections, Crippling stresses by Needham's and Gerard's methods. Thin walled column strength. Sheet stiffener panels. Effective width, inter rivet and sheet wrinkling failures.

UNIT V STRESS ANALYSIS IN WING AND FUSELAGE 12

Shear and bending moment distribution for semi cantilever and other types of wings and fuselage, thin webbed beam. With parallel and non parallel flanges, Shear resistant web beams, Tension field web beams (Wagner's).

TOTAL : 60

TEXT BOOK

1. Bruhn. E.H. "Analysis and Design of Flight vehicles Structures", Tri – state off set company, USA, 1973.

REFERENCES

1. Peery, D.J., and Azar, J.J., "Aircraft Structures", 2nd edition, McGraw–Hill, N.Y., 1993.
2. Megson, T.M.G., "Aircraft Structures for Engineering Students", Edward Arnold, 1995.
3. Rivello, R.M., "Theory and Analysis of Flight Structures", McGraw-Hill, 1993.

AE1304 - AERODYNAMICS – II

L	T	P	C
3	1	0	4

OBJECTIVE

To understand the behaviour of airflow both internal and external in compressible flow regime with particular emphasis on supersonic flows.

UNIT I ONE DIMENSIONAL COMPRESSIBLE FLOW 10

Energy, Momentum, continuity and state equations. Velocity of sound, Adiabatic steady state flow equations, Flow through converging, diverging passages. Performance under various back pressures.

UNIT II NORMAL, OBLIQUE SHOCKS AND EXPANSION WAVES 15

Prandtl equation and Rankine – Hugonoit relation, Normal shock equations, Pitot static tube, corrections for subsonic and supersonic flows, Oblique shocks and corresponding equations. Hodograph and pressure turning angle, shock polars, flow past wedges and concave corners, strong, weak and detached shocks, Rayleigh and Fanno Flow. Flow past convex corners, Expansion hodograph, Reflection and interaction of shocks and expansion waves, Families of shocks, Methods of Characteristics, Two dimensional supersonic nozzle contours.

UNIT III DIFFERENTIAL EQUATIONS OF MOTION FOR STEADY COMPRESSIBLE FLOWS 12

Small perturbation potential theory, solutions for supersonic flows, Mach waves and Mach angles, Prandtl-Glauert affine transformation relations for subsonic flows, Linearised two dimensional supersonic flow theory, Lift, drag pitching moment and center of pressure of supersonic profiles.

UNIT IV AIRFOIL IN HIGH SPEED FLOWS 12

Lower and upper critical mach numbers, Lift and drag divergence, shock induced separation, Characteristics of swept wings, Effects of thickness, camber and aspect ratio of wings, Transonic area rule, Tip effects.

UNIT V HIGH SPEED WIND TUNNELS 11

Blow down, indraft and induction tunnel layouts and their design features. Transonic, supersonic and hypersonic tunnels and their peculiarities. Helium and gun tunnels, Shock tubes, Optical methods of flow visualization.

TOTAL : 60

TEXT BOOK

1. Rathakrishnan, E., “Gas Dynamics”, Prentice Hall of India, 2003.

REFERENCES

1. Shapiro, A.H., “Dynamics and Thermodynamics of Compressible Fluid Flow”, Ronold Press, 1912.

2. Zucrow, M.J. and Anderson, J.D., “Elements of gas dynamics”, McGraw-Hill Book Co., New York, 1919.
3. Mc Cornick. W., “Aerodynamics, Aeronautics and Flight Mechanics”, John Wiley, New York, 1979.
4. Anderson Jr., D., – “Modern compressible flows”, McGraw-Hill Book Co., New York 1999.

AE1305 - PROPULSION – I

L	T	P	C
3	1	0	4

OBJECTIVE

To understand the principles of operation and design of aircraft and spacecraft power plants.

UNIT I FUNDAMENTALS OF GAS TURBINE ENGINES 12

Illustration of working of gas turbine engine – Thrust equation – Factors affecting thrust. Effect of pressure, velocity and temperature changes of air entering compressor. Methods of thrust augmentation. Characteristics of turboprop, turbofan and turbojet – Performance characteristics.

UNIT II SUBSONIC AND SUPERSONIC INLETS FOR JET ENGINES 12

Internal flow and Stall in subsonic inlets – Boundary layer separation – Major features of external flow near a subsonic inlet – Relation between minimum area ratio and external deceleration ratio – Diffuser performance – Supersonic inlets – Starting problem on supersonic inlets – Shock swallowing by area variation – External declaration – Modes of inlet operation.

UNIT III COMBUSTION CHAMBERS 12

Classification of combustion chambers – Important factors affecting combustion chamber design – Combustion process – Combustion chamber performance – Effect of operating variables on performance – Flame tube cooling – Flame stabilization – Use of flame holders.

UNIT IV NOZZLES 11

Theory of flow in isentropic nozzles – Convergent nozzles and nozzle choking – Nozzle throat conditions – Nozzle efficiency – Losses in nozzles – Over expanded and under expanded nozzles – Ejector and variable area nozzles – Interaction of nozzle flow with adjacent surfaces – Thrust reversal.

UNIT V COMPRESSORS 13

Principle of operation of centrifugal compressor – Work done and pressure rise – Velocity diagrams – Diffuser vane design considerations – Concept of prewhirl – Rotation stall – Elementary

theory of axial flow compressor – Velocity triangles – degree of reaction – Three dimensional – Air angle distributions for free vortex and constant reaction designs – Compressor blade design – Centrifugal and Axial compressor performance characteristics.

TOTAL : 60

TEXT BOOKS

1. Hill, P.G. & Peterson, C.R. “Mechanics & Thermodynamics of Propulsion” Addison – Wesley Longman INC, 1999.

REFERENCES

1. Cohen, H. Rogers, G.F.C. and Saravanamuttoo, H.I.H. “Gas Turbine Theory”, Longman, 1919.
2. Oates, G.C., “Aero thermodynamics of Aircraft Engine Components”, AIAA Education Series, New York, 1915.
3. “Rolls Royce Jet Engine” – Third Edition – 1913.
4. Mathur, M.L. and Sharma, R.P., “Gas Turbine, Jet and Rocket Propulsion”, Standard Publishers & Distributors, Delhi, 1999.

AE1306 - AIRCRAFT STRUCTURES LAB – II

L	T	P	C
0	0	3	1

OBJECTIVE

To experimentally study the unsymmetrical bending of beams, find the location of shear centre , obtain the stresses in circular discs and beams using photoelastic techniques, calibration of photo – elastic materials and study on vibration of beams.

LIST OF EXPERIMENTS

1. Unsymmetrical bending of beams
2. Shear centre location for open sections
3. Shear centre location for closed sections
4. Constant strength beam
5. Flexibility matrix for cantilever beam
6. Beam with combined loading
7. Calibration of Photo- elastic materials
8. Stresses in circular discs and beams using photoelastic techniques
9. Vibrations of beams
10. Wagner beam – Tension field beam

TOTAL : 60

LIST OF EQUIPMENT

(for a batch of 30 students)

Sl.No.	Name of the Equipment	Qty	Experiments Number
1.	Beam Test set –up	2	1, 2, 3,4
2.	Unsymmetrical sections like 'Z' sections	2	1, 2, 3
3.	Channel section and angle section	2	1, 2, 3
4.	Dial gauges	12	1, 2, 3
5.	Weights 1Kg	10	1, 2, 3
6.	Weights 2 Kg	10	1, 2, 3
7.	Beam Test Set – up	2	3, 4
1.	Strain indicator and strain gauges	One set	4,5,6
9.	Photo – elastic apparatus	1	7,1
10.	Amplifier	2	9
11.	Exciter	2	9
12.	Pick – up	2	9
13.	Oscilloscope	2	9
14.	Wagner beam	1	10
15.	Hydraulic Jack	1	10

AE1307 - AIRCRAFT STRUCTURES REPAIR LAB

L	T	P	C
0	0	3	1

OBJECTIVE

To give training on riveting, patchwork, welding and carpentry

LIST OF EXPERIMENTS

1. Aircraft wood gluing
2. Welded patch repair by TIG, MIG, PLASMA ARC.
3. Welded patch repair by MIG
4. Welded patch repair by plasma Arc
5. Fabric Patch repair
6. Riveted patch repairs.

7. Repair of composites
8. Repair of Sandwich panels.
9. Sheet metal forming.
10. Control cable inspection and repair.
11. Repair on Perspex glass panels.
12. Pipe flaring.

TOTAL : 60

LIST OF EQUIPMENT

(for a batch of 30 students)

Sl.No.	Name of the Equipment	Quantity	Experiment No.
1.	Shear cutter pedestal type	1	4,6
2.	Drilling Machine	1	4,5,6
3.	Bench Vices	1	1,5,6
4.	Radius Bend bars	1	2,3
5.	Pipe Flaring Tools	1	9
6.	Carbide Gas Plant	1	4
7.	MIG Weld Plant	1	3
8.	TIG Weld Plant	1	2

AE1308 - PROPULSION LAB - I

L	T	P	C
0	0	3	1

OBJECTIVE

To understand the basic concepts and carryout experiments in Aerospace Propulsion.

LIST OF EXPERIMENTS

1. Study of an aircraft piston engine - assembly of sub systems
2. Study of an aircraft piston engine - various components, their functions and operating principles
3. Study of an aircraft jet engine - assembly of sub systems,
4. Study of an aircraft jet engine - various components, their functions and operating principles
5. Study of forced convective heat transfer.
6. Study of free convective heat transfer.

TOTAL:60

LIST OF EQUIPMENTS

(for a batch of 30 students)

Sl.No	Equipments	Qty	Experiments No.
1.	Piston engines	2	1
2	Jet Engine /Engine model	1	2
3.	Forced Convective apparatus	1	3
4.	Free Convective apparatus	1	4

SEMESTER VI

AE 1309 CIVIL AVIATION REQUIREMENTS - II

L	T	P	C
3	0	0	3

OBJECTIVE

To impart knowledge regarding CAR in India (DGCA) in par with FAA & JAA

UNIT I C.A.R. SERIES " H" 5

C.A.R. series H - requirements of aircraft fuel, fuelling of aircraft and calibration: Aircraft fuels: Unusable fuel supply – calibration of fuel quantity gauge of aircraft; aircraft fueling procedures; aviation fuel at airport – storage, handling & quality control.

UNIT II C.A.R. SERIES " I " & " L" 8

C.A.R. series I – aircraft instruments, equipment and accessories: Aircraft instruments overhaul and periodical inspections; aircraft equipment and instruments; maintenance of test equipments: airworthiness procedures for clean rooms and environments for aircraft systems/accessories shop; flight data recorders, Cockpit voice recorders; GPWS; installation of airborne, Collision avoidance system .

C.A.R. series L aircraft maintenance engineer – licensing: Issue of AME license, its classification and experience requirements, complete series L

UNIT III C.A.R. SERIES " M" & " O" 12

C.A.R. series M – mandatory modifications and inspections: Mandatory modification / inspections.

C.A.R. series O – operational requirement for aircraft : Minimum requirements to be complied by operators; operation of commercial air transport aero planes; operation of general aviation airplanes; operation of commercial air transport helicopters; operation of general aviation helicopters; registration airworthiness and operation of hand gliders and powered hand gliders ;

exit row seating ; airworthiness , maintenance and operational requirements for extended range operations with twin engine aero planes; requirements for operation of aircraft in MNPS airspace; requirements for preparation of operations manual.

Requirements for implementation of reduced vertical separation minimum; aircraft requirements required navigation performance (RNP) / area navigation (RNAV)

UNIT IV C.A.R. SERIES " R " & " S" 8

C.A.R. series R - airborne communication, navigation & radar:

Aircraft radio equipment ; installation of communication, navigation and radar equipments ; installation of mode A/C and mode S transponders; control of electromagnetic interference in modern aircraft; approval f airborne GPS in Aircraft, maintanence of airborne communication & navigation, and Radar equipment.

C.A.R. series S- storage of aircraft parts:

Storage condition and storage /service life of rubber parts and aircraft components containing rubber parts, fixation of period for determining overhaul life of reciprocating engines.

UNIT V C.A.R. SERIES " T " & " X" 12

C.A.R. series T – flight testing of aircraft:

Flight testing of (series) aircraft for issue of C and A; flight testing on aircraft for which C and A had been previously issued.

C.A.R. series X – miscellaneous requirements:

Weight and balance control of an aircraft; provision of first aid kits & physician's kit in an aircraft; use of furnishing materials in aircraft; concessions; aircraft log books; document to be carried on board on Indian registered aircraft; procedure of aircraft for issue of taxi permit; procedure for issue of type approval of aircraft components and equipment including instruments.

TOTAL : 45

REFERENCE

1. Aircraft manual (India) volume – latest edition, the English book store, 17-I, Connaught circus, New Delhi.
2. Civil aviation requirements with latest amendment (section 2 airworthiness) – published by DGCA, the English book store, 17-I, Connaught circus, New Delhi.
3. Aeronautical information circulars (relating to airworthiness) from DGCA. Advisory circulars from DGCA.

AE1310 - PROPULSION – II

L	T	P	C
3	1	0	4

OBJECTIVE

To study in detail about gas turbines, ramjet, fundamentals of rocket propulsion and chemical rockets

UNIT I AIRCRAFT GAS TURBINES 13

Impulse and reaction blading of gas turbines – Velocity triangles and power output – Elementary theory – Vortex theory – Choice of blade profile, pitch and chord – Estimation of stage performance – Limiting factors in gas turbine design- Overall turbine performance – Methods of blade cooling – Matching of turbine and compressor – Numerical problems.

UNIT II RAMJET PROPULSION 12

Operating principle – Sub critical, critical and supercritical operation – Combustion in ramjet engine – Ramjet performance – Sample ramjet design calculations – Introduction to scramjet – Preliminary concepts in supersonic combustion – Integral ram- rocket- Numerical problems.

UNIT III FUNDAMENTALS OF ROCKET PROPULSION 12

Operating principle – Specific impulse of a rocket - Rocket nozzle classification – Rocket performance considerations – Numerical Problems.

UNIT IV CHEMICAL ROCKETS 15

Solid propellant rockets – Selection criteria of solid propellants – Important hardware components of solid rockets – Propellant grain design considerations – Liquid propellant rockets – Selection of liquid propellants – Thrust control in liquid rockets – Cooling in liquid rockets – Limitations of hybrid rockets – Relative advantages of liquid rockets over solid rockets- Numerical Problems.

UNIT V ADVANCED PROPULSION TECHNIQUES 8

Electric rocket propulsion – Ion propulsion techniques – Nuclear rocket – Types – Solar sail- Preliminary Concepts in nozzle less propulsion.

TOTAL : 60

TEXT BOOKS

1. Sutton, G.P., “Rocket Propulsion Elements”, John Wiley & Sons Inc., New York, 5th Edn., 1993.
2. Hill, P.G. & Peterson, C.R. “Mechanics & Thermodynamics of Propulsion” Addison – Wesley Longman INC, 1999.

REFERENCES

1. Cohen, H., Rogers, G.F.C. and Saravanamuttoo, H.I.H., “Gas Turbine Theory”, Longman Co.,

ELBS Ed., 1919.
2. Gorden, C.V., “Aero thermodynamics of Gas Turbine and Rocket Propulsion”, AIAA Education Series, New York, 1919.
3. Mathur, M., and Sharma, R.P., “Gas Turbines and Jet and Rocket Propulsion”, Standard Publishers, New Delhi, 1911.

AE1311 - HEAT TRANSFER

L	T	P	C
3	1	0	4

OBJECTIVE

To introduce the concepts of heat transfer to enable the students to design components subjected to thermal loading.

UNIT I HEAT CONDUCTION 11

Basic Modes of Heat Transfer – One dimensional steady state heat conduction: Composite Medium – Critical thickness – Effect of variation of thermal Conductivity – Extended Surfaces – Unsteady state.

Heat Conduction: Lumped System Analysis – Heat Transfer in Semi infinite and infinite solids – Use of Transient – Temperature charts – Application of numerical techniques.

UNIT II CONVECTIVE HEAT TRANSFER 12

Introduction – Free convection in atmosphere free convection on a vertical flat plate – Empirical relation in free convection – Forced convection – Laminar and turbulent convective heat transfer analysis in flows between parallel plates, over a flat plate and in a circular pipe. Empirical relations, application of numerical techniques in problem solving.

UNIT III RADIATIVE HEAT TRANSFER 12

Introduction to Physical mechanism – Radiation properties – Radiation shape factors – Heat exchange between non – black bodies – Radiation shields.

UNIT IV HEAT EXCHANGERS 13

Classification – Temperature Distribution – Overall heat transfer coefficient, Heat Exchange Analysis – LMTD Method and E-NTU Method.

UNIT V HEAT TRANSFER PROBLEMS IN AEROSPACE ENGINEERING 12

High-Speed flow Heat Transfer, Heat Transfer problems in gas turbine combustion chambers – Rocket thrust chambers – Aerodynamic heating – Ablative heat transfer.

TOTAL : 60

TEXT BOOKS

1. Yunus A. Cengel., “Heat Transfer – A practical approach”, Second Edition, Tata McGraw-Hill, 2002.
2. Incropera. F.P.and Dewitt.D.P. “ Introduction to Heat Transfer”, John Wiley and Sons – 2002.

REFERENCES

1. Lienhard, J.H., “A Heat Transfer Text Book”, Prentice Hall Inc., 1911.
2. Holman, J.P. “Heat Transfer”, McGraw-Hill Book Co., Inc., New York, 6th Edn., 1991.
3. Sachdeva, S.C., “Fundamentals of Engineering Heat & Mass Transfer”, Wiley Eastern Ltd., New Delhi, 1911.
4. Mathur, M. and Sharma, R.P. “Gas Turbine and Jet and Rocket Propulsion”, Standard Publishers, New Delhi 1911.

AE1312 - EXPERIMENTAL STRESS ANALYSIS

L	T	P	C
3	0	0	3

OBJECTIVE

To bring awareness on experimental method of finding the response of the structure to different types of load.

UNIT I MEASUREMENTS 4

Principles of measurements, Accuracy, Sensitivity and range of measurements.

UNIT II EXTENSOMETERS 6

Mechanical, Optical, Acoustical and Electrical extensometers and their uses. Advantages and disadvantages.

UNIT III ELECTRICAL RESISTANCE STRAIN GAUGES 10

Principle of operation and requirements of electrical strain gauges. Types and their uses, Materials for strain gauge. Calibration and temperature compensation, cross sensitivity, Rosette analysis. Wheastone bridge and potentiometer circuits for static and dynamic strain measurements, strain indicators.

UNIT IV PHOTOELASTICITY 10

Two dimensional photo elasticity, Concept of light – photoelastic effects, stress optic law,

Interpretation of fringe pattern, Compensation and separation techniques, Photoelastic materials. Introduction to three dimensional photo elasticity.

UNIT V NON – DESTRUCTIVE TESTING 15

Fundamentals of NDT. Radiography, ultrasonic, magnetic particle inspection, Fluorescent penetrant technique, Eddy current testing, Acoustic Emission Technique, Fundamentals of brittle coating methods, Introduction to Moiré techniques, Holography, ultrasonic C- Scan, Thermograph, Fiber – optic Sensors.

TOTAL : 45

TEXT BOOKS

1. Srinath, L.S., Raghava, M.R., Lingaiah, K., Garagesha, G., Pant B., and Ramachandra, K., "Experimental Stress Analysis", Tata McGraw-Hill, New Delhi, 1914.

REFERENCES

1. Dally, J.W., and Riley, W.F., "Experimental Stress Analysis", McGraw-Hill Inc., New York, 1991.
2. Hetyenyi, M., "Hand book of Experimental Stress Analysis", John Wiley and Sons Inc., New York, 1972.
3. Pollock A.A., "Acoustic Emission in Acoustics and Vibration Progress", Ed. Stephens R.W.B., Chapman and Hall, 1993.

AE1313 - HIGH TEMPERATURE MATERIALS

L	T	P	C
3	0	0	3

OBJECTIVE

To learn damage mechanism and failure of components of elevated temperatures

UNIT I CREEP 9

Factors influencing functional life of components at elevated temperatures, definition of creep curve, various stages of creep, metallurgical factors influencing various stages, effect of stress, temperature and strain rate.

UNIT II DESIGN FOR CREEP RESISTANCE 9

Design of transient creep time, hardening, strain hardening, expressions of rupture life of creep, ductile and brittle materials, Monkman-Grant relationship.

UNIT III FRACTURE 9

Various types of fracture, brittle to ductile from low temperature to high temperature, cleavage fracture, ductile fracture due to micro void coalescence-diffusion controlled void growth; fracture maps for different alloys and oxides.

UNIT IV OXIDATION AND HOT CORROSION 9

Oxidation, Pilling, Bedworth ratio, kinetic laws of oxidation- defect structure and control of oxidation by alloy additions, hot gas corrosion deposit, modified hot gas corrosion, fluxing mechanisms, effect of alloying elements on hot corrosion, interaction of hot corrosion and creep, methods of combat hot corrosion.

UNIT V SUPERALLOYS AND OTHER MATERIALS 9

Iron base, Nickel base and Cobalt base super alloys, composition control, solid solution strengthening, precipitation hardening by gamma prime, grain boundary strengthening, TCP phase, embrittlement, solidification of single crystals, Intermetallics, high temperature ceramics.

TOTAL : 45

TEXT BOOKS

1. Raj. R., “Flow and Fracture at Elevated Temperatures”, American Society for Metals, USA, 1915.
2. Hertzberg R. W., “Deformation and Fracture Mechanics of Engineering materials”, 4th Edition, John Wiley, USA, 1996.
3. Courtney T.H, “Mechanical Behavior of Materials”, McGraw-Hill, USA, 1990.

REFERENCES

1. Boyle J.T, Spencer J, “Stress Analysis for Creep”, Butterworths, UK, 1913.
2. Bressers. J., “Creep and Fatigue in High Temperature Alloys”, Applied Science, 1911.
3. McLean D., “Directionally Solidified Materials for High Temperature Service”, The Metals Society, USA, 1915.

AE1314 AIR TRANSPORTAION AND AIRCRAFT MAINTENANCE

L	T	P	C
3	0	0	3

OBJECTIVE

To study the concepts of air transportation and the maintenance management of aircraft.

UNIT I INTRODUCTION 8

Development of air transportation, comparison with other modes of transport – Role of IATA, ICAO – The general aviation industry airline – Factors affecting general aviation, use of aircraft, airport: airline management and organisation – levels of management, functions of management, Principles of organisation planning the organisation – chart, staff departments & line departments.

UNIT II AIRLINE ECONOMICS 10

Forecasting – Fleet size, Fleet planning, the aircraft selection process, operating cost, passenger capacity, load factor etc. – Passenger fare and tariffs – Influence of geographical, economic & political factors on routes and route selection.

FLEET PLANNING: The aircraft selection process – Fleet commonality, factors affecting choice of fleet, route selection and Capitol acquisition – Valuation & Depreciation – Budgeting, Cost planning – Aircrew evaluation – Route analysis – Aircraft evaluation.

UNIT III PRINCIPLES OF AIRLINES SCHEDULING 10

Equipment maintenance, Flight operations and crew scheduling, Ground operations and facility limitations, equipments and types of schedule – hub & spoke scheduling, advantages / disadvantages & preparing flight plans – Aircraft scheduling in line with aircraft maintenance practices.

UNIT IV AIRCRAFT RELIABILITY 9

Aircraft reliability – The maintenance schedule & its determinations – Condition monitoring maintenance – Extended range operations (EROPS) & ETOPS – Ageing aircraft maintenance production.

UNIT V TECHNOLOGY IN AIRCRAFT MAINTENANCE 8

Airlines scheduling (with reference to engineering) – Product support and spares – Maintenance sharing – Equipments and tools for aircraft maintenance – Aircraft weight control – Budgetary control.

On board maintenance systems – Engine monitoring – Turbine engine oil maintenance – Turbine engine vibration monitoring in aircraft – Life usage monitoring – Current capabilities of NDT – Helicopter maintenance – Future of aircraft maintenance.

TOTAL : 45

TEXT BOOKS

1. FEDRIC J.H., “Airport Management”, 2000.
2. C.H. FRIEND, “Aircraft Maintenance Management”, 2000.

REFERENCES

1. GENE KROPF, “Airline Procedures”.
2. WILSON & BRYON, “Air Transportation”.
3. PHILIP LOCKLIN D, “Economics of Transportation”.
4. “Indian Aircraft manual” – DGCA Pub.
5. ALEXANDER T WELLS, “Air Transportation”, Wadsworth Publishing Company, California, 1993.

AE1315 - AIRCRAFT DESIGN PROJECT – I

L	T	P	C
0	0	3	1

OBJECTIVE

To introduce and develop the basic concept of aircraft design. Each student is assigned with the design of an Airplane (or Helicopter or any other flight vehicle), for given preliminary specifications. The following are the assignments to be carried out:

EXPERIMENTS

Comparative configuration study of different types of airplanes
Comparative study on specification and performance details of aircraft
Preparation of comparative data sheets
Work sheet layout procedures
Comparative graphs preparation and selection of main parameters for the design
Preliminary weight estimations, selection of main parameters,
Power plant selection, Aerofoil selection, Wing tail and control surfaces
Preparation of layouts of balance diagram and three view drawings
Drag estimation
Detailed performance calculations and stability estimates

TOTAL : 60

LIST OF EQUIPMENTS

(for a batch of 30 students)

Sl.No.	Name of the Equipment Quantity	Experiments	Number
1.	Engineering Drawing Board	30	3
2.	Engineering Drawing Instruments	30	3

AE1316 - PROPULSION LAB - II

L	T	P	C
0	0	3	1

OBJECTIVE

To understand the basic concepts and carryout experiments in Aerospace Propulsion.

LIST OF EXPERIMENTS

1. Cascade testing of a model of axial compressor blade row.
2. Study of performance of a propeller.
3. Determination of heat of combustion of aviation fuel.
4. Combustion performance studies in a jet engine combustion chamber.
5. Study of free jet.
6. Study of wall jet.

TOTAL : 60

LIST OF EQUIPMENTS

(for a batch of 30 students)

Sl.No	Equipments	Qty	Experiments No.
1.	Axial compressor blade row model with pressure tapping	1	5
2.	Watertube manometers (20 tubes)	2	5,1,9
3.	Subsonic wind tunnel	1	4
4.	Propeller model static and total pressure probes	4	1,9
5.	2-D travers in mechanism	2	1
6.	Freejet test setup	1	9
7.	Aluminium plates with deflection mechanisms	1	10

AE1317 AERO ENGINE REPAIR AND MAINTENANCE LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVE

To introduce the knowledge of the maintenance and repair of both piston and jet aero engines and the procedures followed for overhaul of aero engines.

LIST OF EXPERIMENTS

1. Stripping of a piston engine
2. Engine (Piston Engine) - cleaning, visual inspection, NDT checks.
3. Piston Engine Components - dimensional checks.
4. Piston – Engine reassembly.
5. Propeller Pitch Setting
6. Stripping of a jet engine
7. Jet Engine – identification of components & defects.
8. Jet Engine – NDT checks and dimensional checks
9. Jet Engine – reassembly.
10. Engine starting procedures.

TOTAL : 60

LIST OF EQUIPMENTS

(for a batch of 30 students)

Sl.No	Equipments	Qty	Experiments No.
1.	Piston Engines	2	1,2,3,4
2.	Jet Engines	2	6,7,1,9
3.	Propeller pitch setting stand	1	5
4.	Aircraft with serviceable stand	1	1 to 10
5.	Precision instruments (Vernier Caliper, Micro meter, Cylinder bore gauge, depth gauge, Bevel Protector and DTI	2 each	3,5,1
6.	NDT Equipments (Defectoscope, Dyepenetrant method, Hot oil Chalk Method	1 each	2,1

EL1331 - COMMUNICATION SKILLS LAB

L	T	P	C
2	0	2	3

OBJECTIVE

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.

Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews.

TOTAL:60

SEMESTER VII

CE1403 - ENVIRONMENTAL SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES

To create an awareness on the various environmental pollution aspects and issues.

To give a comprehensive insight into natural resources, ecosystem and biodiversity.

To educate the ways and means to protect the environment from various types of pollution.

To impart some fundamental knowledge on human welfare measures.

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10

Definition, scope and importance – need for public awareness – forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their ground water, floods, drought, conflicts over water, dams-benefits and problems – mineral resources: use effects on forests and tribal people – water resources: use and over-utilization of surface and exploitation, environmental effects of extracting and using mineral resources, case studies – food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies – land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill /

mountain.

UNIT II ECOSYSTEMS AND BIODIVERSITY 14

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – introduction to biodiversity – definition: genetic, species and ecosystem diversity – biogeographical classification of india – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – biodiversity at global, national and local levels – india as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of india – conservation of biodiversity: in-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds. Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT III ENVIRONMENTAL POLLUTION 8

Definition – causes, 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.

Field study of local polluted site – urban / rural / industrial / agricultural

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – environmental ethics: issues and possible solutions .

UNIT V GLOBAL WARMING 6

climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment protection act – air (prevention and control of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act – issues involved in enforcement of environmental legislation – public awareness

TOTAL : 45

MG1401 - TOTAL QUALITY MANAGEMENT

L	T	P	C
3	0	0	3

OBJECTIVE

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.

UNIT I INTRODUCTION 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT II TQM PRINCIPLES 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT III STATISTICAL PROCESS CONTROL (SPC) 9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT IV TQM TOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

TOTAL : 45

TEXT BOOK

1. Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 11-297-0260-6.

REFERENCES

1. James R.Evans & William M.Lidsay, “The Management and Control of Quality”, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06610-5).
2. Feigenbaum.A.V. “Total Quality Management”, McGraw-Hill, 1991.
3. Oakland.J.S. “Total Quality Management”, Butterworth Hcinemann Ltd., Oxford, 1919.
4. Narayana V. and Sreenivasan, N.S. “Quality Management – Concepts and Tasks”, New Age International 1996.
5. Zeiri. “Total Quality Management for Engineers”, Wood Head Publishers, 1991.

AE1401 - AVIONICS

L	T	P	C
3	0	0	3

OBJECTIVE

To introduce the basic concepts of navigation & communication systems of aircraft.

UNIT I INTRODUCTION TO AVIONICS 6

Need for Avionics in civil and military aircraft and space systems – Integrated Avionics and Weapon system – Typical avionics sub systems – Design and Technologies.

UNIT II PRINCIPLES OF DIGITAL SYSTEMS 10

Digital Computers – Microprocessors – Memories

UNIT III DIGITAL AVIONICS ARCHITECTURE 6

Avionics system architecture–Data buses MIL–STD 1553 B–ARINC 429–ARINC 629.

UNIT IV FLIGHT DECK AND COCKPITS 8

Control and display technologies CRT, LED, LCD, EL and plasma panel - Touch screen - Direct voice input (DVI) - Civil cockpit and military cockpit : MFDS, HUD, MFK, HOTAS

UNIT V INTRODUCTION TO AVIONICS SYSTEMS 15

Communication Systems - Navigation systems - Flight control systems - Radar electronic warfare - Utility systems Reliability and maintainability - Certification.

TOTAL : 45

TEXT BOOKS

1. Malcrno A.P. and Leach, D.P., “Digital Principles and Application”, Tata McGraw-Hill, 1990.
2. Gaonkar, R.S., “Microprocessors Architecture – Programming and Application”, Wiley and Sons Ltd., New Delhi, 1990.

REFERENCES

1. Middleton, D.H., Ed., “Avionics Systems, Longman Scientific and Technical”, Longman Group UK Ltd., England, 1919.
2. Spitzer, C.R., “Digital Avionic Systems”, Prentice Hall, Englewood Cliffs, N.J., USA., 1917.
3. Brain Kendal, “Manual of Avionics”, The English Book HOuse, 3rd Edition, New Delhi, 1993.

AE1402 - COMPOSITE MATERIALS AND STRUCTURES

L	T	P	C
3	0	0	3

OBJECTIVE

To understand the fabrication, analysis and design of composite materials & structures.

UNIT I STRESS STRAIN RELATION 6

Introduction- Advantages and application of composite materials, reinforcements and matrices – Generalised Hooke’s Law – Elastic constants for anisotropic, orthotropic and isotropic materials.

UNIT II METHODS OF ANALYSIS 12

Micro mechanics – Mechanics of materials approach, elasticity approach to determine material properties – Macro Mechanics – Stress-strain relations with respect to natural axis, arbitrary axis – Determination of material properties. Experimental characterization of lamina.

UNIT III LAMINATED PLATES 12

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

UNIT IV SANDWICH CONSTRUCTIONS 8

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

UNIT V FABRICATION PROCESS 7

Various Open and closed mould processes. Manufacture of fibers – Types of resins and properties and applications – Netting analysis.

TOTAL : 45

TEXT BOOKS

1. Calcote, L R. "The Analysis of laminated Composite Structures", Von – Noastrand Reinhold Company, New York 1991.
2. Jones, R.M., "Mechanics of Composite Materials", McGraw-Hill, Kogakusha Ltd., Tokyo, 1915.

REFERENCES

1. Agarwal, B.D., and Broutman, L.J., "Analysis and Performance of Fibre Composites", John Wiley and sons. Inc., New York, 1995.
2. Lubin, G., "Handbook on Advanced Plastics and Fibre Glass", Von Nostrand Reinhold Co., New York, 1919.

AE1403 - AIRCRAFT DESIGN PROJECT – II

L	T	P	C
0	0	3	1

OBJECTIVE

To enhance the knowledge in continuation of the design project given in project–I Each student is assigned with work in continuation of the design project – I. The following assignments are to be carried out.

LIST OF EXPERIMENTS

1. V-n diagram for the design study
2. Gust and maneuverability envelopes
3. Critical loading performance and final V-n graph calculation
4. Structural design study – Theory approach
5. Load estimation of wings
6. Load estimation of fuselage.
7. Balancing and Maneuvering loads on tail plane, Aileron and Rudder loads.
8. Detailed structural layouts
9. Design of some components of wings, fuselage
10. Preparation of a detailed design report with CAD drawings.

TOTAL : 60

LIST OF EQUIPMENTS

(for a batch of 30 students)

S.No.	Items	Quantity	Experiment No.
1.	Drawing Board	30	4 and 5
2.	Drawing Instrument	20	4 and 5

AE1404 - AIRCRAFT SYSTEM LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVE

To train the students "ON HAND" experience in maintenance of various air frame systems in aircraft and rectification of common snags.

LIST OF EXPERIMENTS

1. Aircraft "Jacking Up" procedure
2. Aircraft "Levelling" procedure
3. Control System "Rigging check" procedure
4. Aircraft "Symmetry Check" procedure
5. "Flow test" to assess of filter element clogging
6. "Pressure Test" To assess hydraulic External/Internal Leakage
7. "Functional Test" to adjust operating pressure
8. "Pressure Test" procedure on fuel system components
9. " Brake Torque Load Test" on wheel brake units
10. Maintenance and rectification of snags in hydraulic and fuel systems.

TOTAL : 60

LIST OF EQUIPMENTS

(for a batch of 30 students)

S.No	Items	Quantity	Experiment No.
1.	Serviceable aircraft with all above systems	1	1,2,3,4,5,6,7,1,9,10
2.	Hydraulic Jacks (Screw Jack)	5	1,2,4,1
3.	Trestle adjustable	5	1,2,4,1
4.	Spirit Level	2	1

5.	Levelling Boards	2	1
6.	Cable Tensiometer	1	1
7.	Adjustable Spirit Level	1	1
8.	Plumb Bob	1	1

AE1405 - AVIONICS LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVE

This laboratory is divided into three parts to train the students to learn about basic digital electronics circuits, programming with microprocessors, design and implementation of data buses in avionics with MIL – Std. 1553B and remote terminal configuration and their importance in different applications in the field of Avionics.

LIST OF EXPERIMENTS

DIGITAL ELECTRONICS

1. Addition/Subtraction of binary numbers.
2. Multiplexer/Demultiplexer Circuits.
3. Encoder/Decoder Circuits.
4. Timer Circuits, Shift Registers, Binary Comparator Circuits.

MICROPROCESSORS

5. Addition and Subtraction of 1-bit and 16-bit numbers.
6. Sorting of Data in Ascending & Descending order.
7. Sum of a given series with and without carry.
8. Greatest in a given series & Multi-byte addition in BCD mode.
9. Interface programming with 4 digit 7 segment Display & Switches & LED's.
10. 16 Channel Analog to Digital Converter & Generation of Ramp, Square, Triangular wave by Digital to Analog Converter.

AVIONICS DATA BUSES

11. Study of Different Avionics Data Buses.
12. MIL-Std – 1553 Data Buses Configuration with Message transfer.
13. MIL-Std – 1553 Remote Terminal Configuration.

TOTAL : 60

LIST OF EQUIPMENT (for a batch of 30 students)

S.No.	Details of Equipments	Quantity	Experiment Nos.
1.	Adder/Subtractor Binary bits Kit	6	1
2.	Timer Kit	6	1
3.	Encoder Kit	6	3
4.	Decoder Kit	6	3
5.	Comparator Kit	6	4
6.	Multiplexer Kit	6	2
7.	Demultiplexer Kit	6	2
8.	Shift Registers Kit	6	4
9.	Electronic Design Experimeter	6	6,7,9,10
10.	Microprocessor 1015 Kit	9	5,6,7,1,9,10
11.	4 Digit 7 Segment Display	3	6
12.	Switches & LED's Circuit	3	6
13.	16 Channel AD Converter	6	10,9
14.	Digital to Analog Converter	6	10
15.	Cathode Ray Oscilloscope	3	9,10
16.	Regulated Power Supply (5V DC)	9	1, 2,3,4
17.	MIL-Std 1553B Setup with Remote Terminal	1	12,13
18.	Computers	2	11,12,13

AE1406 - IDENTIFICATION OF PROJECT WORK.

L	T	P	C
0	0	2	0

OBJECTIVE:

To find out the tentative area of the project work.

SEMESTER VIII

AE1407 - ROCKTES AND MISSILES

L	T	P	C
3	0	0	3

OBJECTIVE

To introduce basic concepts of design and trajectory estimation of rocket and missiles

UNIT I ROCKETS SYSTEM 10

Ignition System in rockets – types of Igniters – Igniter Design Considerations – Design Consideration of liquid Rocket Combustion Chamber, Injector Propellant Feed Lines, Valves, Propellant Tanks Outlet and Helium Pressurized and Turbine feed Systems – Propellant Slosh and Propellant Hammer – Elimination of Geysering Effect in Missiles – Combustion System of Solid Rockets.

UNIT II AERODYNAMICS OF ROCKETS AND MISSILES 13

Airframe Components of Rockets and Missiles – Forces Acting on a Missile While Passing Through Atmosphere – Classification of Missiles – methods of Describing Aerodynamic Forces and Moments – Lateral Aerodynamic Moment – Lateral Damping Moment and Longitudinal Moment of a Rocket – lift and Drag Forces – Drag Estimation – Body Upwash and Downwash in Missiles – Rocket Dispersion – Numerical Problems.

UNIT III ROCKET MOTION IN FREE SPACE AND GRAVITATIONAL FIELD 10

One Dimensional and Two Dimensional rocket Motions in Free Space and Homogeneous Gravitational Fields – description of Vertical, Inclined and Gravity Turn Trajectories – Determination of range and Altitude Simple Approximations to Burnout Velocity.

UNIT IV STAGING AND CONTROL OF ROCKETS AND MISSILES 7

Rocket Vector Control – Methods – Thrust determination – SITVC – Multistaging of rockets – Vehicle Optimization – Stage Separation Dynamics – Separation Techniques.

UNIT V MATERIALS FOR ROCKETS AND MISSILES 5

Selection of Materials – Special Requirements of Materials to Perform under Adverse Conditions.

TOTAL : 45

TEXT BOOKS

1. Sutton, G.P., et al., “Rocket Propulsion Elements”, John Wiley & Sons Inc., New York, 1993.

REFERENCES

1. Mathur, M., and Sharma, R.P., “ Gas Turbines and Jet and Rocket Propulsion”, Standard Publishers, New Delhi 1991.
2. Cornelisse, J.W., “ Rocket Propulsion and Space Dynamics”, J.W., Freeman & Co. Ltd.,

London, 1912.
3. Parket, E.R., " Materials for Missiles and Spacecraft", McGraw-Hill Book Co. Inc., 1912.

AE1408 - PROJECT WORK
(Common to all Branches)

L	T	P	C
0	0	24	6

OBJECTIVE

The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

Each student shall finally produce a comprehensive report covering back round information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines.

The continuous assessment shall be made as prescribed by the regulation (Hindustan University Regulations 2008 for B.E., B.Tech. programmes)

ELECTIVES I & II
SEMESTER VII
GE 1401 - PROFESSIONAL ETHICS AND HUMAN VALUES

L	T	P	C
3	0	0	3

OBJECTIVE

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of Others

UNIT I HUMAN VALUES 10

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

UNIT II ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.

Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 8

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

TOTAL : 45

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New, York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available).
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and

Engineers", Oxford University Press, Oxford, 2001.

AE1409 - THEORY OF ELASTICITY

L	T	P	C
3	0	0	3

OBJECTIVE

To understand the theoretical concepts of material behaviour with particular emphasis on their elastic property

UNIT I ASSUMPTIONS IN ELASTICITY 4

Definitions- notations and sign conventions for stress and strain, Equations of equilibrium.

UNIT II BASIC EQUATIONS OF ELASTICITY 15

Strain – displacement relations, Stress – strain relations, Lame's constant – cubical dilation, Compressibility of material, bulk modulus, Shear modulus, Compatibility equations for stresses and strains, Principal stresses and principal strains, Mohr's circle, Saint Venant's principle.

UNIT III PLANE STRESS AND PLANE STRAIN PROBLEMS 8

Airy's stress function, Bi-harmonic equations, Polynomial solutions, Simple two-dimensional problems in Cartesian coordinates like bending of cantilever and simply supported beams, etc.

UNIT IV POLAR COORDINATES 10

Equations of equilibrium, Strain displacement relations, Stress – strain relations, Axi – symmetric problems, Kirsch, Michell's and Boussinesque problems.

UNIT V TORSION 8

Navier's theory, St. Venant's theory, Prandtl's theory on torsion, The semi- inverse method and applications to shafts of circular, elliptical, equilateral triangular and rectangular sections.

TOTAL : 45

TEXT BOOK

1. Timoshenko, S., and Goodier, T.N., "Theory of Elasticity", McGraw–Hill Ltd., Tokyo, 1990.

REFERENCES

1. Enrico Volterra & J.H. Caines, "Advanced Strength of Materials", Prentice Hall New Jersey, 1991.
2. Wng, C.T., "Applied Elasticity", McGraw–Hill Co., New York, 1993.
3. Sokolnikoff, I.S., "Mathematical Theory of Elasticity", McGraw–Hill New York, 1971.

AE1410 - SPACE MECHANICS

L	T	P	C
3	0	0	3

OBJECTIVE

To study the basic concepts of orbital Mechanics with particular emphasis on interplanetary trajectories

UNIT I BASIC CONCEPTS 4

The Solar System – References Frames and Coordinate Systems – The Celestial Sphere – The Ecliptic – Motion of Vernal Equinox – Sidereal Time – Solar Time – Standard Time – The Earth's Atmosphere.

UNIT II THE GENERAL N-BODY PROBLEM 10

The many body Problem – Lagrange – Jacobian Identity –The Circular Restricted Three Body Problem – Libration Points- Relative Motion in the N-body Problem –Two –Body Problem – Satellite Orbits – Relations Between Position and Time – Orbital Elements.

UNIT III SATELLITE INJECTION AND SATELLITE ORBIT PERTURBATIONS 12

General Aspects of satellite Injections – Satellite Orbit Transfer –Various Cases – Orbit Deviations Due to Injection Errors – Special and General Perturbations – Cowell's Method – Encke's Method – Method of vibrations of Orbital Elements – General Perturbations Approach.

UNIT IV INTERPLANETARY TRAJECTORIES 6

Two Dimensional Interplanetary Trajectories –Fast Interplanetary Trajectories – Three Dimensional Interplanetary Trajectories – Launch if Interplanetary Spacecraft –Trajectory about the Target Planet.

UNIT V BALLISTIC MISSILE TRAJECTORIES AND MATERIALS 13

The Boost Phase – The Ballistic Phase –Trajectory Geometry- Optimal Flights – Time of Flight – Re – entry Phase – The Position of the Impact Point – Influence Coefficients. Space Environment – Peculiarities – Effect of Space Environment on the Selection of Spacecraft Material.

TOTAL : 45

TEXT BOOK

1. Cornelisse, J.W., "Rocket Propulsion and Space Dynamic", W.H. Freeman & Co., 1914.

REFERENCES

1. Sutton, G.P., “Rocket Propulsion Elements”, John Wiley, 1993.
2. Van de Kamp, P., “Elements of Astromechanics”, Pitman, 1979.
3. Parker E.R., “Materials for Missiles and Spacecraft”, McGraw-Hill Book Co. Inc., 1912.

AE1411 - AIRCRAFT GENERAL ENGINEERING AND MAINTENANCE PRACTICES

L	T	P	C
3	0	0	3

OBJECTIVE

To teach the students about the basic concepts of aircraft general engineering and maintenance practices.

UNIT I AIRCRAFT GROUND HANDLING AND SUPPORT EQUIPMENT 10

Mooring, jacking, levelling and towing operations – Preparation – Equipment - precautions – Engine starting procedures – Piston engine, turboprops and turbojets – Engine fire extinguishing – Ground power units.

UNIT II GROUND SERVICING OF VARIOUS SUB SYSTEMS 8

Air conditioning and pressurization – Oxygen and oil systems – Ground units and their maintenance.

UNIT III MAINTENANCE OF SAFETY 5

Shop safety – Environmental cleanliness – Precautions.

UNIT IV INSPECTION 10

Process – Purpose – Types – Inspection intervals – Techniques – Checklist – Special inspection – Publications, bulletins, various manuals – FAR Air worthiness directives – Type certificate Data Sheets – ATA specifications.

UNIT V AIRCRAFT HARDWARE, MATERIALS, SYSTEMS PROCESSES 12

Hand tools – Precision instruments – Special tools and equipments in an airplane maintenance shop – Identification terminology – Specification and correct use of various aircraft hardware (i.e. nuts, bolts, rivets, screws etc.) – American and British systems of specifications – Threads, gears, bearings, etc. – Drills, tapes & reamers. – identification of all types of fluid line fittings. Materials, metallic and non-metallic - Plumbing Connectors - Cables – Swaging procedures, tests, Advantages of swaging over splicing.

TOTAL : 45

TEXT BOOK

1. KROES WATKINS DELP, “Aircraft Maintenance and Repair” – McGraw-Hill, New York 1993.

REFERENCES

1. A & P MECHANICS, “Aircraft hand Book” – F. A. A. Himalayan Book House, New Delhi, 1996.
2. A & P MECHANICS, “General hand Book” – F. A. A. Himalayan Book House, New Delhi, 1996.

AE1412 - WIND TUNNEL TECHNIQUES

L	T	P	C
3	0	0	3

OBJECTIVE

To introduce the basic concepts of measurement of forces and moments on models during the wind tunnel testing.

UNIT I PRINCIPLES OF MODEL TESTING 6

Buckingham Theorem – Non-Dimensional Numbers –Scale Effect Types of Similartes.

UNIT II WIND TUNNELS 8

Classification – Special problems of Testing in Subsonic, Transonic, supersonic and hypersonic speed regions – Layouts – sizing and design parameters.

UNIT III CALIBRATION OF WIND TUNNELS 11

Test section speed – Horizontal buoyancy – Flow angularities – Turbulence measurements – Associated instrumentation – Calibration of supersonic tunnels.

UNIT IV WIND TUNNEL MEASUREMENTS 12

Pressure and velocity measurements – Force measurements – Three component and six component balances – Internal balances.

UNIT V FLOW VISUALIZATION 8

Smoke and Tuft grid techniques – Dye injection special techniques – Optical methods of flow visualization.

TOTAL : 45

TEXT BOOK

1. Rae, W.H. and Pope, A. “Low Speed Wind Tunnel Testing”, John Wiley Publication, 1914.

REFERENCE

1. Pope, A., and Goin, L., “High Speed wind Tunnel Testing”, John Wiley, 1915.

AE1413 - VIBRATIONS AND AEROELASTICITY

L	T	P	C
3	0	0	3

OBJECTIVE

To study the dynamic behaviour of different aircraft components and the interaction among the aerodynamic, elastic and inertia forces

UNIT I BASIC NOTIONS 8

Simple harmonic motion – Terminologies – Newton’s Law – D’ Alembert’s principle – Energy Methods

UNIT II SINGLE DEGREE OF FREEDOM SYSTEMS 12

Free vibrations – Damped vibrations – Forced Vibrations, with and without damping – support excitation – Vibration measuring instruments.

UNIT III MULTI DEGREES OF FREEDOM SYSTEMS 10

Two degrees of freedom systems – Static and Dynamic couplings vibration absorber- Principal co- ordinates, Principal modes and orthogonal condition – Eigen value problems.

Hamilton’s principle- Lagrangean equation and application – Vibration of elastic bodies- Vibration of strings- Longitudinal, Lateral and Torsional vibrations.

UNIT IV APPROXIMATE METHODS 5

Rayleigh’s and Holzer Methods to find natural frequencies.

UNIT V ELEMENTS OF AEROELASTICITY 10

Concepts – Coupling – Aero elastic instabilities and their prevention – Basic ideas on wing divergence, loss and reversal of aileron control – Flutter and its prevention.

TOTAL : 45

TEXT BOOKS

1. TIMOSHENKO S., “Vibration Problems in Engineering”– John Wiley and Sons, New York, 1993.
2. FUNG Y.C., “An Introduction to the Theory of Aeroelasticity” – John Wiley & Sons, New York, 1995.

REFERENCES

1. BISPLINGHOFF R.L., ASHELY H and HOGMAN R.L., “Aeroelasticity” – Addision Wesley Publication, New York, 1913.
2. TSE. F.S., MORSE, I.F., HUNKLE, R.T., “Mechanical Vibrations”, – Prentice Hall, New York, 1914.
3. SCANLAN R.H. & ROSENBAUM R., “Introduction to the study of Aircraft Vibration & Flutter”, John Wiley and Sons. New York, 1912.
4. BENSON H.TONGUE, “Principles of Vibration”, Oxford University Press, 2000.

AE1414 - FINITE ELEMENT METHOD

L	T	P	C
3	0	0	3

OBJECTIVE

To introduce the concept of numerical analysis of structural components

UNIT I INTRODUCTION 4

Review of basic analysis – Stiffness and Flexibility matrix for simple cases – Governing equation and convergence criteria of finite element method.

UNIT II DISCRETE ELEMENTS 12

Bar, Frame, beam elements – Application to static, dynamic and stability analysis.

UNIT III CONTINUUM ELEMENTS 10

Various types of 2-D-elements Application to plane stress, plane strain and axisymmetric problems.

UNIT IV ISOPARAMETRIC ELEMENTS 10

Applications to two and three-dimensional problems.

UNIT V FIELD PROBLEM 9

Applications to other field problems like heat transfer and fluid flow.

TOTAL : 45

TEXT BOOK

1. Tirupathi.R. Chandrapatha and Ashok D. Belegundu, “Introduction to Finite Elements in Engineering”, Prentice Hall India, Third Edition, 2003.

REFERENCES

1. Reddy J.N. “An Introduction to Finite Element Method”, McGraw-Hill, 2000.

2. Krishnamurthy, C.S., “Finite Element Analysis”, Tata McGraw-Hill, 2000.
3. Bathe, K.J. and Wilson, E.L., “Numerical Methods in Finite Elements Analysis”, Prentice Hall of India, 1915.

AE1415 - AIRFRAME MAINTENANCE AND REPAIR

L	T	P	C
3	0	0	3

OBJECTIVE

To study the maintenance aspect of airframe systems and rectification of snags

UNIT I WELDING IN AIRCRAFT STRUCTURAL COMPONENTS 10

Equipments used in welding shop and their maintenance – Ensuring quality welds – Welding jigs and fixtures – Soldering and brazing.

SHEET METAL REPAIR AND MAINTENANCE

Inspection of damage – Classification – Repair or replacement – Sheet metal inspection – N.D.T. Testing – Riveted repair design, Damage investigation – reverse technology.

UNIT II PLASTICS AND COMPOSITES IN AIRCRAFT 10

Review of types of plastics used in airplanes – Maintenance and repair of plastic components – Repair of cracks, holes etc., various repair schemes – Scopes.

Inspection and Repair of composite components – Special precautions – Autoclaves.

UNIT III AIRCRAFT JACKING, ASSEMBLY AND RIGGING 8

Airplane jacking and weighing and C.G. Location. Balancing of control surfaces – Inspection maintenance. Helicopter flight controls. Tracking and balancing of main rotor.

UNIT IV REVIEW OF HYDRAULIC AND PNEUMATIC SYSTEM 10

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 SAFETY PRACTICES 7

Hazardous materials storage and handling, Aircraft furnishing practices – Equipments. Trouble

shooting - Theory and practices.

TOTAL : 45

TEXT BOOK

1. KROES, WATKINS, DELP, “Aircraft Maintenance and Repair”, McGraw-Hill, New York, 1992.

REFERENCES

1. LARRY REITHMEIR, “Aircraft Repair Manual”, Palamar Books, Marquette, 1992.
2. BRIMM D.J. BOGGES H.E., “Aircraft Maintenance”, Pitman Publishing corp. New York, 1940

ELECTIVES III & IV

SEMESTER VIII

MG 1402 - ENTREPRENEURSHIP DEVELOPMENT

L	T	P	C
3	0	0	3

OBJECTIVE

To motivate entrepreneurial capabilities among the final year students to cope up with present industrial scenario.

UNIT I ENTREPRENEURSHIP 9

Entrepreneur –traits of Entrepreneurs- Types of Entrepreneurs- Intrepreneur difference between Entrepreneur and Intrepreneur- Entrepreneurship in Economic Growth, Factors affecting entrepreneurial growth.

UNIT II MOTIVATION 9

Major Motives Influencing Entrepreneur- Achievement Motivation Training, Self Rating, Business Game, Thematic Apperception Test- Stress Management. Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS 9

Small Enterprises – Definition, Classification – Characteristics, Ownership; structure- project formulation -setting up a business- selecting a good business opportunity – market survey and research,

Techno economic feasibility assessment - preliminary project Report- Project appraisal- sources of information – Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 9

Need – sources of finance, term Loans ,Capital Structure , Financial Institution , Management

of working capital , costing break Even analysis, Network analysis techniques of PERT/CPM-Taxation - income tax,Excise Duty – Sales tax.

UNIT V SUPPORT TO ENTREPRENEURS 9

Institutional support ot entrepreneurs- Sickness in small business – concept, Magnitude, Causes and Consequences, Corrective Measures – Government Policy for small scale enterprise –Growth strategies in small industry. – Expansion, Diversification, Joint Venture, Merger and Sub-contracting.

TOTAL:45

TEXT BOOK

1. SS. Khanka,Entrepreneurial Development ,S.Chand & Co. Ltd, Ram Nagar ,New Delhi, 1999.

REFERENCE

1. EDII – "Faculty & External Experts – A Hand book for New Entrepreneurs". Publishers Entrepreneurship Development – Institute of India, Ahmedabad,1986.

AE1416 - AERO ENGINE MAINTENANCE AND REPAIR

L	T	P	C
3	0	0	3

OBJECTIVE

To study the basic concepts of the maintenance and repair of both piston and jet aero engines and the procedures followed for overhaul of aero engines.

UNIT I CLASSIFICATION OF PISTON ENGINE COMPONENTS 5

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 INSPECTION OF PISTON ENGINES 8

Inspection and maintenance and trouble shooting – Inspection of all engine components – Daily and routine checks – Overhaul procedures – Compression testing of cylinders – Special inspection schedules – Engine fuel, control and exhaust systems – Engine mount and super charger – Checks and inspection procedures.

UNIT III INSPECTION OF PISTON ENGINES 10

Symptoms of failure – Fault diagnostics – Case studies of different engine systems – I: Tools and equipment requirements for various checks and alignment during overhauling – Tools for inspection – Tools for safety and for visual inspection – Methods and instruments for non destructive testing techniques – Equipment for replacement of part and their repair. Engine testing: Engine testing procedures and schedule preparation – Online maintenance.

UNIT IV CLASSIFICATION OF JET ENGINE COMPONENTS 12

12 Types of jet engines – Principles of operation – Functions of components – Materials used – Details of starting and operating procedures – Gas turbine engine inspection & checks – Use of instruments for online maintenance – Special inspection procedures : Foreign Object Damage – Blade damage – etc.

Maintenance procedures of gas turbine engines – Trouble shooting and rectification procedures – Component maintenance procedures – Systems maintenance procedures.

Gas turbine testing procedures – test schedule preparation – Storage of Engines – Preservation and de-preservation procedures.

UNIT V OVERHAUL PROCEDURES 10

Engine Overhaul procedures – Inspections and cleaning of components – Repairs schedules for overhaul – Balancing of Gas turbine components.

Trouble Shooting - Procedures for rectification – Condition monitoring of the engine on ground and at altitude – engine health monitoring and corrective methods.

TOTAL : 45

TEXT BOOK

1. KROES & WILD, “Aircraft Power plants”, 7th Edition – McGraw Hill, New York, 1994.

REFERENCES

1. TURBOMECA, “Gas Turbine Engines”, The English Book Store, New Delhi, 1993.
2. UNITED TECHNOLOGIES PRATT & WHITNEY, “The Aircraft Gas turbine Engine and its Operation”, (latest edition) The English Book Store, New Delhi.

AE1417 - THEORY OF PLATES AND SHELLS

L T P C

3 0 0 3

OBJECTIVE

To study the behaviour of the plates and shells with different geometry under various types of loads.

UNIT I CLASSICAL PLATE THEORY 3

Classical Plate Theory – Assumptions – Differential Equation – Boundary Conditions.

UNIT II PLATES OF VARIOUS SHADES 15

Navier's Method of Solution for Simply Supported Rectangular Plates – Leavy's Method of Solution for Rectangular Plates under Different Boundary Conditions. Governing Equation – Solution for Axi-symmetric loading – Annular Plates – Plates of other shapes.

UNIT III EIGEN VALUE ANALYSIS 8

Stability and free Vibration Analysis of Rectangular Plates.

UNIT IV APPROXIMATE METHODS 10

Rayleigh – Ritz, Galerkin Methods– Finite Difference Method – Application to Rectangular Plates for Static, Free Vibration and Stability Analysis.

UNIT V SHELLS 9

Basic Concepts of Shell Type of Structures – Membrane and Bending Theories for Circular Cylindrical Shells.

TOTAL : 45

TEXT BOOK

1. Timoshenko, S.P. Winowsky. S., and Kreger, "Theory of Plates and Shells", McGraw - Hill Book Co. 1990.

REFERENCES

1. Flugge, W. "Stresses in Shells", Springer – Verlag, 1915.
2. Timoshenko, S.P. and Gere, J.M., "Theory of Elastic Stability", McGraw-Hill Book Co. 1961.

AE1418 - COMPUTATIONAL FLUID DYNAMICS

L T P C

3 0 0 3

OBJECTIVE

To study the flow of fluids using computational methods

UNIT I FUNDAMENTAL CONCEPTS 10

Introduction - Basic Equations of Fluid Dynamics - Incompressible In viscid Flows: Source, vortex and doublet panel, methods - lifting flows over arbitrary bodies. Mathematical properties of Fluid Dynamics Equations -_ Elliptic, Parabolic and Hyperbolic equations - Well posed problems - discretization of partial Differential Equations -Transformations and grids - Explicit finite difference methods of subsonic, supersonic and viscous flows.

UNIT II PANEL METHODS 7

Introduction – Source panel method – Vortex panel method – Applications.

UNIT III DISCRETIZATION 8

Boundary layer Equations and methods of solution -Implicit time dependent methods for inviscid and viscous compressible flows - Concept of numerical dissipation --Stability properties of explicit and implicit methods - Conservative upwind discretization for Hyperbolic systems - Further advantages of upwind differencing.

UNIT IV FINITE ELEMENT TECHNIQUES 10

Finite Element Techniques in Computational Fluid Dyna¬mics; introduction - Strong and Weak Formulations of a Boundary Value Problem - Strong formulation - Weighted Residual Formulation - Galerkin Formulation - Weak Formu¬lation - Variational Formulation - Piecewise defined shape functions - Implementation of the FEM - The Solu¬tion Procedure.

UNIT V FINITE VOLUME TECHNIQUES 10

Finite Volume Techniques - Cell Centered Formulation - ~ Lax - Vendoroff Time Stepping - Runge - Kutta Time Stepping - Multi - stage Time Stepping - Accuracy -. Cell Vertex Formulation - Multistage Time Stepping - FDM -like Finite Volume Techniques - Central and Up-wind Type Discretizations - Treatment of Derivatives.

TOTAL : 45

TEXT BOOK

1. Fletcher, C.A.J., “Computational Techniques for Fluid Dynamics”, Vols. I and II, Springer - Verlag, Berlin, 1911.

REFERENCES

1. John F. Wendt (Editor), “Computational Fluid Dyna¬mics - An Introduction”, Springer – Verlag, Berlin, 1992

2. Charles Hirsch, “Numerical Computation of Internal and External Flows”, Vols. I and II. John Wiley & Sons, New York, 1911.
3. Klaus A Hoffmann and Steve T. Chiang. “Computational Fluid Dynamics for Engineers”, Vols. I & II Engineering Education System, P.O. Box 20071, W. Wichita, K.S., 67201 - 1071 USA, 1993.
4. Anderson, Jr.D., “Fundamentals of Aerodynamics”, McGraw-Hill, 2000.

AE1419 - FATIGUE AND FRACTURE MECHANICS

L	T	P	C
3	0	0	3

OBJECTIVE

To study the concepts of estimation of the endurance and failure mechanism of components

UNIT I FATIGUE OF STRUCTURES 7

S.N. curves - Endurance limits - Effect of mean stress, Goodman, Gerber and Soderberg relations and diagrams - Notches and stress concentrations - Neuber’s stress concentration factors - Plastic stress concentration factors - Notched S.N. curves.

UNIT II STATISTICAL ASPECTS OF FATIGUE BEHAVIOUR 10

Low cycle and high cycle fatigue - Coffin - Manson’s relation - Transition life - cyclic strain hardening and softening - Analysis of load histories - Cycle counting techniques -Cumulative damage - Miner’s theory - Other theories.

UNIT III PHYSICAL ASPECTS OF FATIGUE 10

Phase in fatigue life - Crack initiation - Crack growth - Final Fracture - Dislocations - fatigue fracture surfaces.

UNIT IV FRACTURE MECHANICS 10

Strength of cracked bodies - Potential energy and surface energy - Griffith’s theory - Irwin - Orwin extension of Griffith’s theory to ductile materials - stress analysis of cracked bodies - Effect of thickness on fracture toughness - stress intensity factors for typical geometries.

UNIT V FATIGUE DESIGN AND TESTINIG 8

Safe life and Fail-safe design philosophies - Importance of Fracture Mechanics in aerospace structures - Applica¬tion to composite materials and structures.

TOTAL : 45

TEXT BOOKS

1. Prasanth Kumar – “Elements of fracture mechanics” – Wheeter publication, 1999.
2. Barrois W, Ripely, E.L., “Fatigue of aircraft structure”, Pergamon press. Oxford, 1913.

REFERENCES

1. Sin, C.G., “Mechanics of fracture” Vol. I, Sijthoff and w Noordhoff International Publishing Co., Netherlands, 1919.
2. Knott, J.F., “Fundamentals of Fracture Mechanics”, Buterworth & Co., Ltd., London, 1913

AE1420 - HELICOPTER MAINTENANCE

L	T	P	C
3	0	0	3

OBJECTIVE

To study the procedure adapted to the maintenance of helicopter.

UNIT I HELICOPTER FUNDAMENTAL 5

Basic directions – Ground handling, bearing – Gears.

UNIT II MAIN ROTOR SYSTEM 9

Head maintenance – blade alignment – Static main rotor balance – Vibration – Tracking – Span wise dynamic balance – Blade sweeping –Electronic balancing – Dampener maintenance – Counter weight adjustment – Auto rotation adjustments – Mast & Flight Control Rotor - Mast – Stabilizer, dampeners – Swash plate flight control systems collective – Cyclic – Push pull tubes – Torque tubes – Bell cranks – Mixer box – Gradient unit control boosts – Maintenance & Inspection control rigging.

UNIT III MAIN ROTOR TRANSMISSIONS 12

Engine transmission coupling – Drive shaft – Maintenance clutch – Free wheeling units – Spray clutch – Roller unit – Torque meter – Rotor brake – Maintenance of these components – vibrations – Mounting systems – Transmissions.

UNIT IV POWER PLANTS & TAIL ROTORS 12

Fixed wing power plant modifications – Installation – Different type of power plant maintenance.

Tail rotor system – Servicing tail rotor track – System rigging.

UNIT V AIRFRAMES AND RELATED SYSTEMS 7

Fuselage maintenance – Airframe Systems – Special purpose equipment.

TOTAL : 45

TEXT BOOK

1. JEPPESEN, “Helicopter Maintenance”, Jeppesons and Sons Inc., 2000.

REFERENCES

1. “Civil Aircraft Inspection Procedures”, Part I and II, CAA, English Book House, New Delhi, 1916.
2. LARRY REITHMIER, “Aircraft Repair Manual”, Palamar Books Marquette, 1992.

AE1421 - AIR TRAFFIC CONTROL AND AERODROME DESIGN

L	T	P	C
3	0	0	3

OBJECTIVE

To study the procedure of the formation of aerodrome and its design and air traffic control.

UNIT I BASIC CONCEPTS 9

Objectives of ATS - Parts of ATC service – Scope and Provision of ATCs – VFR & IFR operations – Classification of ATS air spaces – Varies kinds of separation – Altimeter setting procedures – Establishment, designation and identification of units providing ATS – Division of responsibility of control.

UNIT II AIR TRAFFIC SERVICES 9

Area control service, assignment of cruising levels minimum flight altitude ATS routes and significant points – RNAV and RNP – Vertical, lateral and longitudinal separations based on time / distance –ATC clearances – Flight plans – position report

UNIT III FLIGHT INFORMATION ALERTING SERVICES, COORDINATION, EMERGENCY PROCEDURES AND RULES OF THE AIR 10

Radar service, Basic radar terminology – Identification procedures using primary / secondary radar – performance checks – use of radar in area and approach control services – assurance control and co-ordination between radar / non radar control – emergencies – Flight information and advisory service – Alerting service – Co-ordination and emergency procedures – Rules of the air.

UNIT IV AERODROME DATA, PHYSICAL CHARACTERISTICS AND OBSTACLE RESTRICTION 9

Aerodrome data - Basic terminology – Aerodrome reference code – Aerodrome reference point – Aerodrome elevation – Aerodrome reference temperature – Instrument runway, physical

Characteristics; length of primary / secondary runway – Width of runways – Minimum distance between parallel runways etc. – obstacles restriction.

UNIT V VISUAL AIDS FOR NAVIGATION, VISUAL AIDS FOR DENOTING OBSTACLES EMERGENCY AND OTHER SERVICES 8

Visual aids for navigation Wind direction indicator – Landing direction indicator – Location and characteristics of signal area – Markings, general requirements – Various markings – Lights, general requirements – Aerodrome beacon, identification beacon – Simple approach lighting system and various lighting systems – VASI & PAPI - Visual aids for denoting obstacles; object to be marked and lighter – Emergency and other services.

TOTAL : 45

TEXT BOOK

1. AIP (India) Vol. I & II, "The English Book Store", 17-1, Connaught Circus, New Delhi.

REFERENCES

1. "Aircraft Manual (India) Volume I", latest Edition – The English Book Store, 17-1, Connaught Circus, New Delhi.
2. "PANS – RAC – ICAO DOC 4444", Latest Edition, The English Book Store, 17-1, Connaught Circus, New Delhi.

AE1422 - COMPUTER INTEGRATED MANUFACTURING

L	T	P	C
3	0	0	3

OBJECTIVE

This course will enable the student

- To gain knowledge on how computers are integrated at various levels of planning and manufacturing.
- To understand the flexible manufacturing system and to handle the product data and various software used for manufacturing

UNIT I INTRODUCTION 8

The meaning and origin of CIM- the changing manufacturing and management scene - External communication - islands of automation and software-dedicated and open systems-manufacturing automation protocol - product related activities of a company- marketing engineering - production planning - plant operations - physical distribution- business and financial management.

UNIT II GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING 10

History of group technology- role of G.T. in CAD/CAM integration - part families - classification and coding - DCLASS and MICLASS and OPITZ coding systems-facility design using G.T. - benefits of G.T. - cellular manufacturing.

Process planning - role of process planning in CAD/CAM integration - approaches to computer aided process planning - variant approach and generative approaches - CAPP and CMPP process planning systems.

UNIT III SHOP FLOOR CONTROL AND INTRODUCTION OF FMS 9

Shop floor control-phases -factory data collection system -automatic identification methods-Bar code technology-automated data collection system.

FMS-components of FMS - types -FMS workstation -material handling and storage systems-FMS layout -computer control systems-application and benefits.

UNIT IV CIM IMPLEMENTATION AND DATA COMMUNICATION 10

CIM and company strategy - system modeling tools -IDEF models - activity cycle diagram CIM open system architecture (CIMOSA)- manufacturing enterprise wheel-CIM architecture- Product data management-CIM implementation software.

Communication fundamentals- local area networks -topology -LAN implementations - network management and installations.

UNIT V OPEN SYSTEM AND DATABASE FOR CIM 8

Open systems-open system inter connection - manufacturing automations protocol and technical office protocol (MAP /TOP)

Development of databases -database terminology- architecture of database systems-data modeling and data associations -relational data bases - database operators - advantages of data base and relational database.

TOTAL : 45

TEXT BOOK

1. Mikell.P.Groover “Automation, Production Systems and computer integrated manufacturing”, Pearson Education 2001.

REFERENCES

1. Yorem koren, “Computer Integrated Manufacturing System”, McGraw-Hill, 1913.
2. Ranky, Paul G., “Computer Integrated Manufacturing”, Prentice Hall International, 1916.
3. David D.Bedworth, Mark R.Hendersan, Phillip M.Wolfe “Computer Integrated Design and Manufacturing”, McGraw-Hill Inc.

4. Roger Hanman “Computer Intergrated Manufacturing”, Addison – Wesley, 1997.
5. Mikell.P.Groover and Emory Zimmers Jr., “CAD/CAM”, Prentice Hall of India Pvt. Ltd., New Delhi-1, 1991.
6. Kant Vajpayee S, “Principles of Computer Integrated Manufacturing”, Prentice Hall India, 2003.
7. Radhakrishnan P, Subramanyan S.and Raju V., “CAD/CAM/CIM”, 2nd Edition New Age International (P) Ltd., New Delhi, 2000.