Academic Regulations 2009 for B. Tech (Regular)
(Effective for the students admitted into I year
from the Academic Year 2009-2010 onwards)

Award of B.Tech. Degree

A student will be declared eligible for the award of the B.Tech. Degree if he fulfils the following academic regulations:

i. Pursue a course of study for not less than four academic years and in not more than eight academic years.

ii. Register for 220 credits and secure all 220 credits

Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech course and their admission is cancelled.

Courses of study

The courses of study are offered at present for specialization for the B. Tech. Course:

S.No.	Branch
1.	Aeronautical Engineering.
2.	Biotechnology.
3.	Civil Engineering.
4.	Computer Science and Engineering.
5.	Computer Science and System Engineering.
6.	Electrical and Electronics Engineering.
7.	Electronics and Communication Engineering.
8.	Electronics and Computer Engineering.
9.	Electronics and Control Engineering.
10.	Electronics and Instrumentation Engineering.
11.	Information Technology.
12.	Mechanical Engineering.
13.	Mechanical Engineering (Mechatronics)

and any other course as approved by the authorities of the University from time to time.

Credits

	I Year		Semester	
	Periods / Week	Credits	Periods / Week	Credits
Theory	03	06	03	04
	02	04	--	--
Practical	03	04	03	02
Drawing	06	06	03	02
			06	04
Seminar	--	--	6	02
Project	--	--	15	10

Distribution and Weightage of Marks

The performance of a student in each semester / I year shall be evaluated subject –wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition seminar and project work shall be evaluated for 50 and 200 marks respectively.

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

For theory subjects, during the semester there shall be Two midterm examinations. Each mid term examination consists of objective paper for 10 marks and subjective paper for 20 marks with duration of 1hour 50 minutes (20 minutes for objective and 90 minutes for subjective paper).

Objective paper is set for 20 bits for 10 marks. Subjective paper shall contain 5 questions of which student has to answer 3 questions evaluated* for 20 marks. First mid term examination shall be conducted for I-IV units of syllabus and second mid term examination shall be conducted for V -VIII units. The total marks secured by the student in each mid term examination for 30 marks is considered and the better of the two mid term examinations shall be taken as the final sessional marks secured by each candidate in the subject.

However for first year, there shall be Three midterm examinations as in the above pattern and the average marks of the best two midterm examinations secured in each subject shall be considered as final marks for sessionals.

*Note 1: The subjective paper shall contain 5 questions of equal weightage of 10 marks and the marks obtained for 3questions shall be

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condensed to 20 marks, any fraction rounded off to the next higher mark.

*Note 2: The mid term examination shall be conducted first by distribution of the Objective paper simultaneously marking the attendance, after 20minutes the answered objective paper is collected back. The student is not allowed to leave the examination hall. Then the descriptive question paper and the answer booklet are distributed. After 90minutes the answered booklets are collected back.

- For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 50 end examination marks. Day-to-day work in the laboratory shall be evaluated for 25 marks by the concerned laboratory teacher based on the report of experiments/jobs. The end examination shall be conducted by the laboratory teacher and another examiner.

- For the subject having design and / or drawing, such as Engineering Drawing, Machine Drawing and estimation, the distribution shall be 30 marks for internal evaluation and 70 marks for end examination. The Internal evaluation for sessionals will be 15 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm exams in a Semester for a duration of 2hrs each, evenly distributed over the syllabi for 15 marks and the better of the two shall be considered as internal test marks. The sum of day to day evaluation and the internal test marks will be the final sessionals for the subject. However in the I year class, there shall be three midterm exams and the average of best two will be taken into consideration.

- There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department before presentation. The report and the presentation shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar shall be evaluated for 50 marks and marks shall be submitted to the University along with internal marks. There shall be no external examination for seminar.

- Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination (Viva-voce). The viva-voce shall be conducted by a committee consisting of HOD, Project Supervisor and an External Examiner nominated by the University. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be

made by the departmental committee, on the basis of two seminars given by each student on the topic of his project.

Laboratory marks and the sessional marks awarded by the College are not final. They are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the College will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding.

The laboratory records and internal test papers shall be preserved in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

Attendance Requirements:

i. A student shall be eligible to appear for University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester/ I year.

ii. **Shortage of Attendance below 65% in aggregate shall in <u>NO</u> case be condoned**.

iii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee.

iv. Students whose shortage of attendance is not condoned in any semester / I year are not eligible to take their end examination of that class and their registration shall stand cancelled.

v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester / I year, as applicable. They may seek readmission for that semester / I year when offered next.

vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the University.

Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**6**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. In the Seminar he should secure 40%.

ii. A student shall be promoted from II to III year only if he fulfils the academic requirement of securing **40** credits from

One regular and one supplementary examinations of I year.

One regular examination of II year I semester.

    irrespective of whether the candidate takes the end examination or not as per the normal course of study.

iii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing **68** credits from the following examinations,

a. Two regular and two supplementary examinations of I year.

b. Two regular and one supplementary examinations of II year I semester.

c. One regular and one supplementary examinations of II year II semester.

d. One regular examination of III year I semester.

    irrespective of whether the candidate takes the end examination or not as per the normal course of study.

And in case of getting detained for want of credits by sections ii and iii above, the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Third or Fourth year I semester respectively.

iv. A student shall register and put up minimum attendance in all 220 credits and earn all the 220 credits. Marks obtained in all 220 credits shall be considered for the calculation of percentage of marks obtained.

v. Students who fail to earn 220 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

8.   Course pattern:

The entire course of study is of four academic years. The first year shall be on yearly pattern and the second, third and fourth years on semester pattern.

A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

When a student is detained due to lack of credits / shortage of attendance he may be re-admitted when the semester is offered after fulfilment of academic regulations, whereas he continues to be in the academic regulations he was first admitted.

9.   Transitory Regulations:

Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work

with the same or equivalent subjects as and when subjects are offered, subject to Section **2**. and they continues to be in the academic regulations they were first admitted.

10. **With–holding of results**:

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

11. **Award of Class:**

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

Class Awarded	% of marks to be secured	
First Class with Distinction	70% and above	From the aggregate marks secured for the best 220 Credits.
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

12. Minimum Instruction Days:

The minimum instruction days including exams for each semester / I year shall be 90/180 days respectively.

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

14. There shall be no place transfer within the Constituent Colleges.

15. **General:**
    i. **The academic regulations should be read as a whole for purpose of any interpretation**.
    ii. **Malpractices rules- nature and punishments is appended.**
    iii. **Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".**

    iv.   **In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.**

    v.   **The University may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on roles with effect from the dates notified by the University.**

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

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2010-2011 and onwards)

1. **Award of B.Tech. Degree**

    A student admitted in LES will be declared eligible for the award of the B. Tech Degree if he fulfils the following academic regulations:

    i. Pursue a course of study for not less than three academic years and in not more than six academic years.

    ii. Register for 168 credits and secure all 168 credits from II to IV year of Regular B.Tech. program

2. Students, who fail to fulfil the requirement for the award of the degree in <u>six</u> consecutive academic years from the year of admission, shall forfeit their seat.

3. The regulations **3** to **6** are to be adopted as that of B. Tech. (Regular).

7. **Minimum Academic Requirements:**

    The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**6**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. For the Seminar he should secure 40% in the internal evaluation.

ii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of 42 credits from the following examinations.

    a. Two regular and one supplementary examinations of II year I semester.

    b. One regular and one supplementary examinations of II year II semester.

    c. One regular examination of III year I semester.
       irrespective of whether the candidate takes the end examination or not as per the normal course of study.

       and in case of getting detained for want of credits the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Fourth year I semester.

8. **Course Pattern**

    i. The entire course of study is three academic years on semester pattern.

ii.   A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

iii.   When a student is detained due to lack of credits / shortage of attendance he may be re-admitted when the semester is offered after fulfilment of academic regulations, whereas he continues to be in the academic regulations he was first admitted.

9. The regulations **9** to **10** are to be adopted as that of B. Tech. (Regular).

11. Award of Class:

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

First Class with Distinction	70% and above	From the aggregate marks secured for 168 Credits. (i.e. II year to IV year)
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

12. The regulations **12** to **15** are to be adopted as that of B. Tech. (Regular). All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)

RULES FOR
DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is

		subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the

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	hall.	candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be

		handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
    (i) A show cause notice shall be issued to the college.
    (ii) Impose a suitable fine on the college.

Shifting the examination centre from the college to another college for a specific period of not less than one year.

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

Course structure for B.Tech. (Regular) I year (2009-10) for affiliated Engineering Colleges.

AERONAUTICAL ENGINEERING (Aero.E)
(Common for Branches: M.E., C.E, Bio-Tech., Aero.E.)

S.No	Course code	Subject	Th	Tu/Drg./Lab.			Credits
1.	9ABS101	English	2				4
2.	9ABS102	Engineering Physics	2				4
3.	9ABS103	Engineering Chemistry	2				4
4.	9ABS104	Mathematics – I	3	1	-	-	6
5.	9A05101	Programming in C and Data Structures	3	1	-	-	6
6.	9A03101	Engineering Drawing *		-	6	-	6
7.	9A01101	Engineering Mechanics	3	1	-	-	6
8.	9A05102	C Programming & Data Structures Lab		-	-	3	4
9.	9A03102	Engineering & I.T. Workshop #		-	-	3	4
10.	9ABS106	Engineering Physics and Engineering Chemistry Lab **		-	-	3	4
11.	9ABS107	English Language & Communication Skills Lab		-	-	3	4
		contact periods/week	15	3	6	12	52
			Total contact periods/week			36	

Th = Theory; Tu = Tutorial; Drg = Drawing & Lab = Laboratory:

* Engineering Drawing will have University External Exam.
** The Students attend the Physics lab and Chemistry lab. in alternate week that is 3/2 per week. The end exam shall be conducted separately and average of the two exams will be recorded by the exam section
# The Students attend Engineering and IT work shop as a single lab. every week and the end exam is conducted as a single lab. sharing the

Maximum marks and time for one task from Engineering workshop and one from IT workshop. The sum of the marks awarded will be recorded

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

AERONAUTICAL ENGINEERING (Aero.E)

B.Tech II - I Semester (Aero.E)

S. No	Course code	Subject	Theory		Lab.	Credits
1.	9ABS301	Mathematics -II	4			4
2.	9A01301	Mechanics of Solids	4			4
3.	9A02301	Electrical Engineering and Electronics Engineering	4			4
4.	9A03301	Materials Science and Engineering	4			4
5.	9A03302	Thermodynamics	4			4
6.	9A21301	Aircraft Engineering Drawing with CAD		6		4
7.	9A02302	Electrical Engineering Lab / Electronics Engineering Lab			3	2
8.	9A03304	Material Science Lab/ Mechanics of Solids Lab			3	2
		contact periods/week	20	6	6	28
		Total		32		

*NOTE: In Electrical Engineering and Electronics Engineering two questions from each part should be chosen to answer five questions in the End semester examination.

The Students attend the Electrical Engineering lab and Electronics Engineering lab in alternate week that is 3/2 per week.
The Students attend the Material Science lab and Mechanics of Solids lab in alternate week that is 3/2 per week.
Machine Drawing will be 4 hrs End Exam

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

AERONAUTICAL ENGINEERING (Aero.E)

B.Tech II - II Semester (Aero.E)

S. No	Course code	Subject	Theory		Lab.	Credits
1.	9A21401	Introduction to Aerospace Engineering	4			4
2.	9ABS303	Environmental Science	4			4
3.	9A21402	Aero space Vehicle structures-I	4			4
4.	9A21403	Aerodynamics -I	4			4
5.	9A21404	Mechanics of Fluids	4			4
6.	9A21405	Aircraft Production Technology	4			4
7.	9A21406	Fluid Mechanics lab/ Aerodynamics lab			3	2
8.	9A21407	Aircraft Production Technology Lab			3	2
		contact periods/week	24		6	28
			Total	30		

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
ANANTAPUR**

**AERONAUTICAL ENGINEERING (Aero.E)
COURSE STRUCTURE**

III B. Tech. – I Semester (Aero.E)

S. No	Course code	Subject	Theory		Lab.	Credits
1.	9A21501	Mathematics for Aerospace Engineers	4			4
2.	9A21502	Flight Mechanics-I	4			4
3.	9A21503	Aerodynamics – II	4			4
4.	9A21504	Aerospace Vehicle Structures – II	4			4
5.	9A21505	Aerospace Propulsion – I	4			4
6.	9A21506	Mechanisms and Mechanical Design	4			4
7.	9A21507	Aerospace Structures Lab			3	2
8.	9A21508	Propulsion Lab			3	2
			24		6	28
			Total	30		

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

III B. Tech. – II Semester (Aero.E)

S. No	Course code	Subject	Theory		Lab.	Credits
1.	9A21601	Flight Mechanics-II	4			4
2.	9A21602	Avionics	4			4
3.	9A21603	Aerospace Propulsion - II	4			4
4.	9A21604	Flight Vehicle Design	4			4
5.	9A21605	Operations Management	4			4
6.	9A21606	Introduction to Space Technology	4			4
7.	9A21607	Flight Vehicle Design Lab			3	2
8.	9AHS601	Advanced English Communication Skills Lab			3	2
			24		6	28
			Total	30		

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
ANANTAPUR**

IV B. Tech. – I Semester (Aero.E)

S. No	Course code	Subject	Theory		Lab.	Credits
1.	9A21701	Finite element & Modeling Methods	4			4
2.	9A21702	Vibrations and Structural Dynamics	4			4
3.	9A21703	Computational Aero Dynamics	4			4
4.	9A21704	Structural Analysis and Detailed Design	4			4
5.	9A21705 9A21706 9A21707	**ELECTIVE - I** Experimental Stress Analysis Analysis of Composites Structure Airport Management	4			4
6.	9A21708 9A21709 9A21710	**ELECTIVE - II** Air Line Management Rockets and Missiles Propellant Technology	4			4
7.	9A21711	Computational Structural and Aerodynamics Lab			3	2
8.	9A21712	Structural Analysis and Detailed Design Lab			3	2
			24		6	28
			Total	30		

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

IV B. Tech. – II Semester (Aero.E)

S. No	Course code	Subject	Theory		Lab.	Credits
1.	9A21801	Aircraft instrumentation and Control Systems	4			4
2.	9A21802	Aerospace Transportation Systems	4			4
3.	9A21803 9A21804 9A21805	**ELECTIVE – III** System Modeling and Simulation Helicopter Engineering Space Mechanics	4			4
4.	9A21806 9A03505 9A21807	**ELECTIVE – IV** Aircraft Maintenance Manag Heat Transfer Aero elasticity	4			4
5.		Seminar	--		--	2
6.		Project Work	--		--	10
			16			28
			Total	28		

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

Detailed Syllabus

B.Tech. I Year (Aero.E)   **T   P   C**
                                                         2   0   4

(9ABS101) ENGLISH

1.   INTRODUCTION :

The sweeping changes in the world have elevated English to the status of a tool of global communication and transformed it into   e-English. The syllabus has been drafted to improve the competence of students in communication in general and language skills in particular. The books prescribed serve as students' handbooks.

The teacher should focus on the skills of reading, writing, listening and speaking while using the prescribed text and exercises. The classes should be interactive. The students should be encouraged to participate in the classroom proceedings and also to write short paragraphs and essays. The main aim is to encourage two way communications in place of the one-sided lecture.
.

The text for non-detailed study is meant for extensive reading by the students. They may be encouraged to read some select topics on their own, which could lead into a classroom discussion. In addition to the exercises from the texts done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements etc.

2. OBJECTIVES:
   a.   To improve the language proficiency of the students in English with an emphasis on LSRW skills.
   b.   To equip the students to study academic subjects with greater facility through theoretical and practical components of the syllabus.
   c.   To develop study skills as well as communication skills in formal and informal situations.

3. SYLLABUS :
Listening Skills:
Objectives
1. To enable students to develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation

2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and dialects.

Students should be given practice in listening and identifying the sounds of English language and to mark stress , right intonation in connected speech.

 • Listening for general content
 • Listening to fill up information
 • Intensive listening
 • Listening for specific information

Speaking Skills :

Objectives

1. To make students aware of the role of ability to speak fluent English and its contribution totheir success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.
 • Oral practice
 • Describing objects/situations/people
 • Role play – Individual/Group activities
 • Just A Minute (JAM) Sessions.

(Using exercises from all units of the prescribed text)

Reading Skills:

Objectives

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

 The students shall be trained in reading skills using the prescribed text for detailed study. They shalll be examined in reading and answering questions using 'unseen' passages which may be taken from the non-detailed text or other authentic texts, such as articles from magazines/newspapers

Writing Skills:

Objectives

1. To develop an awareness in the students the skill to write exact and formal writing

2. To equip them with the components of different forms of writing.
   • Writing sentences
   • Use of appropriate vocabulary
   • Paragraph writing
   • Coherence and cohesiveness
   • Narration / description
   • Note Making
   • Formal and informal letter writing
   • Editing a passage

4. TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content are prescribed and divided into Eight Units:

For Detailed study: **ENJOYING EVERYDAY ENGLISH**,
Sangam Books (India) Pvt Ltd, Hyderabad, 2009
For Non-detailed study: **INSPIRING LIVES**,
Maruti Publications, Guntur, 2009

Unit -I
    a. Heaven's Gate from **ENJOYING EVERYDAY ENGLISH**
    b. Mokshagundam Visvesaraya from **INSPIRING LIVES**

Unit -II
    a. Sir C.V.Raman from **ENJOYING EVERYDAY ENGLISH**
    b. Mother Teresa from **INSPIRING LIVES**

Unit -III
    a. The Connoisseur from **ENJOYING EVERYDAY ENGLISH**
    b. Dr. Amartya Kumar Sen from **INSPIRING LIVES**

Unit -IV
    a. The Cuddalore Experience from **ENJOYING EVERYDAY ENGLISH**
    b. Gertrude Elion from **INSPIRING LIVES**

Unit -V
    a. Bubbling Well Road from **ENJOYING EVERYDAY ENGLISH**
    b. Vishwanathan Anand from **INSPIRING LIVES**

Unit-VI
    a. Odds Against Us from **ENJOYING EVERYDAY ENGLISH**
    b. Charlie Chaplin from **INSPIRING LIVES**

Unit – VII
Exercises on
Reading and Writing Skills
Reading Comprehension
Letter writing
Report writing

Unit – VIII

Exercises on Remedial Grammar covering Common errors in English, Subject-Verb agreement, Use of Articles and Prepositions, Active/Passive Voice, Reported speech, Tenses Vocabulary development covering Synonyms & Antonyms, one-word substitutes, prefixes & suffixes, Idioms & phrases, words often confused.

Evaluation: The question paper shall contain two parts, Part A containing questions from Units I- VI and Part B containing questions from units VII & VIII. The student is required to answer five full questions choosing at least one from Part B.

REFERENCES:
1. Technical Communication , Principle and Practice, Meenakshi Raman and Sangita Sharma, OUP, 2009
2. Essential Grammar in Use, (with CD) 3/e, Cambridge University Press, 2009
3. Resumes and Interviews, M.Ashraf Rizvi, Tata – McGraw Hill, 2009
4. Everyday Dialogues in English by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
5. Communication Skills for Technical Students, Farhathullah, T.M., Orient Blackswan, 2008
6. Developing Communication Skills, 2/e. by Krishna Mohan & Meera Banerji , Macmillan, 2009
7. English for Technical Communication, Vol. 1 & 2, by K. R. Lakshmi Narayanan, Sci tech. Publications.
8. Basic Communication Skills For Technology, Andrea J Ruthurford, Pearson Education , Asia.
9. Longman Dictionary of Contemporary English with DVD,   Pearson Longman

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B.Tech. I Year (Aero.E)   **T   P   C**
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(9ABS102) ENGINEERING PHYSICS

UNIT I- OPTICS: Interference - Interference in thin films by reflection - Newton's rings - Diffraction - Fraunhofer diffraction at a single slit - Fraunhofer diffraction at a double slit - Diffraction grating - Grating spectrum - polarization - Nicol prism -Theory of circular and elliptical polarized light - Quarter and half wave plates.

UNIT II- CRYSTAL STRUCTURES AND X-RAY DIFFRACTION: Introduction -Space lattice - Basis - Unit cell - Lattice parameter - Bravais lattices - Crystal systems - Structure Simple cubic - Body Centered Cubic – Face Centered Cubic crystals - Miller indices of planes and directions in crystals – Separation between successive (h k l) planes - X-ray diffraction by crystal planes - Bragg's law – Laue and Powder methods.

UNIT III- PRINCIPLES OF QUANTUM MECHANICS & ELECTRON THEORY: Waves and Particles - de- Broglie's hypothesis – Heisenberg's uncertainty principle - Schroedinger's one dimensional wave equation (Time Independent) - Particle in a one dimensional potential box – Energy levels - Fermi-Dirac distribution   and effect of Temperature (qualitative treatment only) – Scattering - Source of electrical resistance - Kronig-Penney model (qualitative treatment only) - energy bands – metals, semi conductors & insulators.

UNIT IV- SEMICONDUCTORS: Intrinsic and extrinsic semiconductors – Law of mass action – Continuity equation – Drift & diffusion - Einstein's relation – Hall effect – Direct & indirect band gap semiconductors – p-n junction - Band diagram of p-n junction diode – Diode Equation-LED, LCD & Photo diode.

UNIT V- MAGNETIC PROPERTIES: Introduction - Origin of magnetic moment – Classification of magnetic materials - Dia, Para , Ferro, anti-Ferro and Ferri magnetism - Hysteresis - Soft and hard magnetic materials – Magnetic bubbles memory.

DIELECTRIC PROPERTIES: Introduction - Dielectric constant - Electronic, Ionic and Orientation polarizations (qualitative treatment only) - Local field - Clausius-Mossotti equation –Frequency dependence of polarisability (qualitative treatment only) – Ferro electricity- $BaTio_3$.

UNIT VI- SUPERCONDUCTIVITY: General properties - Meissner effect - Penetration depth - Type I and Type II superconductors - Flux quantization – Josephson effects – BCS theory - Applications of superconductors.

LASERS: Introduction – Characteristics of laser - Spontaneous and stimulated emission of radiation - Einstein's coefficients - Population inversion - Ruby Laser - Helium-Neon Laser – GaAs Laser - Applications of Lasers in Industry, Scientific and Medical fields.

UNIT VII- FIBER OPTICS: Introduction - Principle of optical fiber - Acceptance angle and Acceptance cone - Numerical aperture – Types of Optical fibers and refractive index profiles – Optical fiber communication systems - Application of optical fibers.

UNIT VIII- NANOMATERIALS : Introduction - Basic principles of nano materials – Fabrication of nano materials - ball milling –plasma arching – Chemical vapour deposition method – sol-gel methods – properties of nano materials – carbon nanotubes – properties and applications of carbon nano tubes - Applications of nano materials.

TEXT BOOKS:
1. Engineering Physics by P.K.Palanisamy, Scitech Publications
2. Engineering Physics by V. Rajendran & K.Thyagarajan, Tata McGraw-Hill Publishing Co. Ltd.
3. Engineering Physics by M.R.Srinivasan New Age Publications

REFERENCES:
1. Physics Volume 2, by Halliday, Resnick and Krane; John Wiley India
2. Solid State Physics by C.Kittel, Wiley India
3. Engineering Physics by Mittal, I.K.International
4. Introduction to Nanoscience & Nano Technology by K.K Chattopadhyay & A.N. Banarjee ,   Prentice – Hall of India Pvt. Ltd

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(9ABS103) ENGINEERING CHEMISTRY

UNIT I: Water: Sources of Water, Types of impurities in Water, Hardness of Water – Temporary and Permanent hardness. Units. Estimation of hardness by EDTA Method. Analysis of Water - Dissolved Oxygen. Disadvantages of Hard Water. Problems on hardness of water. Methods of Treatment of Water for Domestic Purpose – Sterilisation: Chlorination, Ozonisation.

Water for Industrial purpose - Water for Steam Making, Boiler Troubles – Carry Over (Priming and Foaming), Boiler Corrosion, Scales and Sludge, Caustic Embrittlement. Water Treatment: - Internal Treatment – Colloidal, Phosphate, Calgon, Carbonate, Sodium aluminates Conditioning of Water. External Treatment - Ion- Exchange Process; Demineralization of Brakish Water – Reverse Osmosis.

UNIT II: **Science of Corrosion:** Definition, Types of corrosion: Dry Corrosion, (Direct Chemical attack), Wet Corrosion, Theories of Corrosion and Mechanism, Electro Chemical Theory of Corrosion.   Galvanic Series, Galvanic Corrosion, Concentration Cell Corrosion, Oxygen absorption type. Factors Influencing Corrosion. Control of Corrosion – Cathodic Protection – Sacrificial anode and Impressed Current. Uses of Inhibitors. Electro Plating, and Electro less plating (copper and nickel)

UNIT III: **Polymers:** Polymerization Reactions – Basic concepts. Types of Polymerization – Addition and Condensation Polymerization. Plastics – Thermosetting and Thermoplastics. Composition, Properties and Engineering Uses of the Following: Teflon, Bakelite, Nylon. Rubber – Processing of Natural Rubber and Compounding. Elastomers – Buna S, Buna N, Polyurethane Rubber; Silicone Rubber. Conducting Polymers, Synthesis and applications of Polyacetylene and Poly aniline

Liquid Crystals definition, properties, suitable examples and Engineering Applications

UNIT IV: **Chemistry of nano materials:**   Nano materials definition, properties and applications;

Explosives and Propellants: Explosives, Classification, precautions during storage, blasting fuses, important explosives. Rocket propellants, classification of propellants**.**

Lubricants : Principles and function of lubricants - Classification and properties of lubricants – Viscosity, flash and fire points, cloud and pour points, aniline point, Neutralisation Number and Mechanical Strength.

UNIT V: Electro Chemistry: Conductance – Equivalent Conductance – Molecular Conductance, Conductometric Titrations – Applications of Conductivity Measurements.

 Electrochemical Cells: Measurement of EMF, Standard electrode potential, concentration cells, batteries (Ni–Cd cell), Lithium batteries. Fuel cell: hydrogen oxygen fuel cell and methanol fuel cell

Insulators – Definition, Properties and Characteristics of Insulating Materials; Engineering Applications.

UNIT VI: Phase rule: Definition, Terms involved in Phase Rule and Phase rule equation. Phase diagrams – one component system (water system), two component system (lead- silver system) Eutectics, heat treatment based on iron-carbon phase diagram, hardening, annealing.

UNIT VII: Fuels and Combustion: Definition and Classification of fuels. Solid, liquid & gaseous fuels, Characteristics of a good fuel. Metallurgical Coke – Characteristics & Manufacture (Otto-Halfmann). Petroleum – Refining – Synthetic Petrol. Calorific Value & its determination (Bomb Calorimeter – Junker's Gas Calorimeter). Combustion: Flue gas analysis by Orsat's apparatus.

UNIT VIII: Building Materials: Cement: composition of Portland cement, analysis, setting and hardening of cement (reactions).

Refractories : Definition, Classification With Examples; Criteria of a Good Refractory Material; Causes for the failure of a Refractory Material

TEXT BOOKS:

1. Engineering Chemistry Prof. K.N.Jayaveera, Dr.G.V.Subba Reddy and Dr.C. Ramachandraiah, McGraw Hill Higher Education Hyd., 2009
2. A text book of Engineering Chemistry by S.S. Dara, S.Chand & Co, New Delhi (2008)
3. Text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, 15th edition New Delhi (2008).

REFERENCES:
1. Engineering Chemistry Dr. K. B. Chandrasekhar, Dr. U.N. Dash, Dr. Sujatha Mishra, Scitech Publications(India) Pvt. Limted, Hyderabad. 2009
2. Fuel Cells principles and applications by B.Viswanath, M.Aulice Scibioh-Universities press
3. Chemistry of Engineering Materials by C.V. Agarwal, Tara Publication, Varanasi.20084. Physical Chemistry - Glasston & Lewis.
4. 5. Engineering Chemistry (Vol.1&2) by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co,   New Delhi (2004)
5. 6. Applied Chemistry: A Text Book for chemistry for Engineers & Technologists, G.D. Gesser,   Springer, 2000

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B.Tech. I Year (Aero.E)   **Th   Tu   C**

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(9ABS104) MATHEMATICS – I

UNIT I– Differential equations of first order and first degree – Exact, linear and Bernoulli equations. Applications: to Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

UNIT   II– Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, Sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x), method of variation of parameters.

UNIT III– Rolle's Theorem – Lagrange's Mean Value Theorem – (excluding proof). Simple examples of Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrangian method of Multipliers with three variables only.

UNIT – IV

Raidus of Curvature – Curve tracing – Cartesian, polar and parametric curves. Applications of integration to lengths, volume and surface area of solids of revolution in Cartesian and polar coordinates

UNIT   V– Multiple integral: – Double and triple integrals – Change of Variables – Change of order of integration.

UNIT VI– Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

UNIT VII– Differentiation and integration of Laplace transform – Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT VIII– Vector Calculus: Gradient – Divergence – Curl and Their properties; Vector integration – Line integral - Potential function – Area , Surface and volume integrals. Vector integral theorems: Green's theorem –

Stoke's and Gauss's Divergence Theorem (excluding their proof). Verification of Green's–Stoke's and Gauss's Theorems.

TEXT BOOKS:

1. A Text Book of Engineering Mathematics, Vol – 1, T.K.V. Iyengar, B. Krishna Gandhi and Others, S. Chand & Company.
2. A Text Book of Engineering Mathematics, C. Sankaraiah, V.G.S. Book Links.
3. A Text Book of Engineering Mathematics-1,E. Rukmangadachari, E. Keshava Reddy, Pearson Education.

REFERENCES:

1. A Text Book of Engineering Mathematics, B.V. Ramana, Tata Mc Graw Hill.
2. A Text Book of Engineering Mathematics, Thomson Book Collection.
3. A Text Book of Advanced Engineering Mathematics – A Computer Approach, N.Bail, M.Goyal & C. Watkins.
4. Engineering Mathematics, Sarveswara Rao Koneru, Universities Press.

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(9A05101) PROGRAMMING IN C AND DATA STRUCTURES

Unit I- Overview of Computers and Programming - Electronic Computers then and Now, Computer Hardware, Computer Software, Algorithm, Flowcharts, Software Development Method, Applying the Software Development Method.

Unit II- Introduction to C Language - C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Expressions, Precedence and Associativity, Expression Evaluation, Operators and Expressions, Type Conversions, Decision Statements - If and Switch Statements, Loop Control Statements - while, for, do-while Statements, Nested for Loops, Other Related Statements -break, continue, goto.

Unit III- Functions - Library Functions, Top-Down Design and Structure Charts, Functions with and without Arguments, Communications Among Functions, Scope, Storage Classes - Auto, Register, Static, Extern, Scope rules, Type Qualifiers, Recursion - Recursive Functions, Preprocessor Commands.
Arrays - Declaring and Referencing Arrays, Array Subscripts, Using For Loops for Sequential Access, Using Array Elements as Function Arguments, Arrays Arguments, Multidimensional Arrays.

Unit IV- Pointers - Introduction, Features of Pointers, Pointer Declaration, Arithmetic Operations With Pointers, Pointers and Arrays, Pointers and Two-Dimensional Arrays, Array of Pointers, Pointers to Pointers, Void Pointers, Memory Allocation Functions, Programming Applications, Pointer to Functions, Command- Line Arguments.
Strings - String Basics, String Library Functions, Longer Strings, String Comparison, Arrays of Pointers, Character operations, String-To-Number and Number-To- String Conversions, Pointers and Strings.

Unit V- Structure and Union – Introduction, Features of Structures, Declaration and Initialization of Structures, Structure within Structure, Array of Structures, Pointer to Structure, Structure and Functions, typedef, Bit Fields, Enumerated Data Type, Union, Union of Structures.

Unit VI- Files - Introduction, Streams and File Types, Steps for File Operations, File I/O Structures, Read and Write, Other File function, Searching Errors in Reading/Writing of Files, Low Level Disk I/O, Command Line Arguments, Application of Command Line Arguments, File Status functions (error handling).

Unit VII- Data Structures - Overview of Data Structure, Representation of a Stack, Stack Related Terms, Operation on a Stack, Implementation of a Stack, Representation of Arithmetic Expressions, Infix, Prefix, and Postfix Notations, Evaluation of Postfix Expression, Conversion of Expression from Infix to Postfix, Recursion, Queues - Various Positions of Queue, Representation of Queue, Insertion, Deletion, Searching Operations.

Linked List - Singly Linked List, Linked List with and without header, Insertion, Deletion and Searching Operations.

Unit VIII- Searching and Sorting - Exchange (Bubble) Sort, Selection Sort, Quick Sort, Insertion Sort, Merge Sort. Searching- Linear and Binary Search Methods.

TEXT BOOKS :
1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education
2. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

REFERENCES :
1. Programming in C – Stephen G. Kochan, III Edition, Pearson Eductaion.
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
3. C and Data Structures, a snapshot oriented treatise with live engineering examples, Dr. N.B.Venkateswarlu, Dr. E.V.Prasad, S. Chand
4. C and Data Structures, E.Balaguruswamy, Tata Mc Graw Hill
5. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI, Eighth Edition.

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B.Tech. I Year (Aero.E)   **Drg   P   C**
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(9A03101) ENGINEERING DRAWING

UNIT I– INTRODUCTION TO ENGINEERING DRAWING:
Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions. Curves used in Engineering Practice:
a) Conic Sections including the Rectangular Hyperbola – General method only.
b) Cycloid, Epicycloids and Hypocycloid
c) Involutes.
d) Helices

UNIT II– PROJECTION OF POINTS AND LINES: Principles of Orthographic Projection – Conventions – First and Third Angle Projections. Projections of Points, Lines inclined to one or both planes, Problems on projections, Finding True lengths & traces only.

UNIT III– PROJECTIONS OF PLANES: Projections of regular Plane surfaces/figures, Projection of lines and planes using auxiliary planes.

UNIT IV– PROJECTIONS OF SOLIDS: Projections of Regular Solids inclined to one or both planes – Auxiliary Views.

UNIT V– SECTIONS AND DEVELOPMENTS OF SOLIDS: Section Planes and Sectional views of Right Regular Solids–Prism, Cylinder, Pyramid and Cone. True shapes of the sections.

Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid, Cone and their Sectional parts.

UNIT VI– ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS: Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric projections of spherical parts.

Conversion of Isometric projections/views to Orthographic Views – Conventions.

UNIT VII– INTERPENETRATION OF RIGHT REGULAR SOLIDS:
Projections of curves of Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Square Prism Vs Square Prism.

UNIT VIII– PERSPECTIVE PROJECTIONS: Perspective View of Plane Figures and Simple Solids.Vanishing Point Method (General Methods only).

TEXT BOOKS:
1. Engineering Drawing, N.D. Bhat, Charotar Publishers
2. Engineering Drawing, Johle, Tata McGraw-Hill
3. Engineering Drawing, Shah and Rana, 2/e, Pearson Education

REFERENCES:
1. Engineering Drawing and Graphics, Venugopal/ New age
2. Engineering Drawing, B.V.R. Guptha, J.K. Publishesrs
3. Engineering Drawing, K.L. Narayana, P. Khanniah, Scitech Pub.
4. Engineering Drawing, Venkata Reddy, B.S.Publishers.

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B.Tech. I Year (Aero.E)   Th   Tu   C
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(9A01101) ENGINEERING MECHANICS

UNIT I– BASIC CONCEPTS - System of forces– Moment of forces and its Application – Couples and Resultant of Force System
EQUILIBRIUM OF SYSTEM OF FORCES: Free body diagrams –Types of Supports – Support reactions for beams with different types of loading – concentrated, uniformly distributed and uniformly varying loading.

UNIT II– ANALYSIS OF PERFECT FRAMES: Types of frames – cantilever frames and simply supported frames – Analysis of frames using method of joints, Tension Coefficient method and methods of sections for vertical loads, horizontal loads and inclined loads.

UNIT   III– FRICTION: Types of friction– laws of Friction–Limiting friction–Cone of limiting friction– static and Dynamic Frictions – Motion of bodies – Wedge, Screw jack and differential Screw jack.

UNIT   IV– CENTROID AND CENTER OF GRAVITY: Centroids of simple figures – Centroids of Composite figures – Centre of Gravity of bodies – Centre of Gravity of Composite figures.
(Simple problems only).

UNIT V– AREA MOMENT OF INERTIA - Parallel axis and perpendicular axis theorems - Moments of Inertia of Composite Figures
MASS MOMENT OF INERTIA: Moment of Inertia of Simple solids, Moment of Inertia of composite masses.(Simple problems only)

UNIT VI– KINEMATICS : Rectilinear and Curve linear motion – Velocity and Acceleration – Motion of A Rigid Body – Types and their Analysis in Planar Motion.

UNIT VII– KINETICS : Analysis as particles and Analysis as a Rigid Body in Translation – Central Forces of motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies – Work Energy Method – Equation for Translation – Work – Energy application to Particle Motion, Connection System – Fixed axis Rotation and Plane Motion.

UNIT VIII– MECHANICAL VIBRATIONS: Definitions, Concepts. Simple harmonic motion. Free vibrations. Simple, Compound and Torsional pendulums- Numerical problems

TEXT BOOKS:

1. Engineering Mechanics, Shames & Rao – Pearson Education.
2. Engineering Mechanics, Fedrinand L.Singer – B.S. Publishers.
3. Engineering Mechanics, Bhavikatti and Rajasekharappa

REFERENCES:

1. Engineering Mechanics-Statics and dynamics, A.Nelson, Tata McGraw-Hill Company
2. Mechanics of Materials by Timoshenko & Gere, CBS
3. Engineering Mechanics – B. Bhathacharya- Oxford University Publications
4. Mechanics of Materials - Dr. B. C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publication
5. Engineering Mechanics –Arthur P. Boresi and Richard J. Schmidt. – Brooks/Cole – Cengage Learning

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(9A05102) C PROGRAMMING AND DATA STRUCTURES LAB

Objectives:
- To make the student learn a programming language.
- To teach the student to write programs in C to solve the problems.
- To introduce the student to simple linear data structures such as lists, stacks, queues.

Recommended Systems/Software Requirements:
- Intel based desktop PC with ANSI C Compiler and Supporting Editors

Exercise l.
a) Write a C program to find the sum of individual digits of a positive integer.
b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Exercise 2.
a) Write a C program to calculate the following Sum:
Sum=$1- x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$
b) Write a C program to find the roots of a quadratic equation.

Exercise 3
a) Write C programs that use both recursive and non-recursive functions

      i) To find the factorial of a given integer.
      ii) To find the GCD (greatest common divisor) of two given
       integers.
      iii) To solve Towers of Hanoi problem.

Exercise 4
a) The total distance travelled by vehicle in 't' seconds is given by distance S = $ut+1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration

(m/sec^2) respectively. Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

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

Exercise 5
a) Write a C program to find both the largest and smallest number in a list of integers.
b) Write a C program that uses functions to perform the following:
    i) Addition of Two Matrices   ii) Multiplication of Two Matrices

Exercise 6
a) Write a C program that uses functions to perform the following operations:
        i) To insert a sub-string in to a given main string from a given position.
        ii) To delete n Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not

Exercise 7
a) Write a C program that displays the position or index in the string S where the string T begins, or − 1 if S doesn't contain T.
b) Write a C program to count the lines, words and characters in a given text.

Exercise 8
a) Write a C program to generate Pascal's triangle.
b) Write a C program to construct a pyramid of numbers.

Exercise 9
Write a C program to read in two numbers, x and n, and then compute the sum of the geometric progression:
$1+x+x^2+x^3+…………+x^n$
For example: if n is 3 and x is 5, then the program computes 1+5+25+125.
Print x, n, the sum
Perform error checking. For example, the formula does not make sense for negative exponents − if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Find if any values of x are also illegal ? If so, test for them too.

Exercise 10
a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
b) Write a C program to convert a Roman numeral to its decimal equivalent.

Exercise 11
Write a C program that uses functions to perform the following operations:
       i) Reading a complex number   ii) Writing a complex number
       iii) Addition of two complex numbers   iv) Multiplication of two complex numbers
(Note: represent complex number using a structure.)

Exercise 12
a) Write a C program which copies one file to another.
b) Write a C program to reverse the first n characters in a file.
(Note: The file name and n are specified on the command line.)
Exercise 13
a) Write a C programme to display the contents of a file.
b) Write a C programme to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Exercise 14
Write a C program that uses functions to perform the following operations on singly linked list.:
       i) Creation   ii) Insertion   iii) Deletion   iv) Traversal

Exercise 15
Write C programs that implement stack (its operations) using
       i) Arrays   ii) Pointers

Exercise 16
Write C programs that implement Queue (its operations) using
       i) Arrays   ii) Pointers

Exercise 17
Write a C program that uses Stack operations to perform the following:
       i) Converting infix expression into postfix expression
       ii) Evaluating the postfix expression

Exercise 18
Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
> i) Bubble sort   ii) Selection sort

Exercise 19
Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
> i) Linear search   ii) Binary search

Exercise 20
Write C program that implements the Quick sort method to sort a given list of integers in ascending order.

Exercise 21
Write C program that implement the Merge sort method to sort a given list of integers in ascending order.

Exercise 22
Write C programs to implement the Lagrange interpolation and Newton-Gregory forward interpolation.

Exercise 23
Write C programs to implement the linear regression and polynomial regression algorithms.

Exercise 24
Write C programs to implement Trapezoidal and Simpson methods.

REFERENCE BOOKS
1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education
2. The Spirit of C, an introduction to modern programming, M.Cooper, Jaico Publishing House.
3. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.
4. Computer Basics and C Programming, V. Rajaraman, PHI Publications.

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(9A03102) ENGINEERING AND I.T. WORKSHOP

ENGINEERING WORKSHOP

Objectives: The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students.

1. TRADES FOR EXERCISES:

    a. Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock

    b. Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock

    c. Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 guage G.I. sheet

    d. House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.

    e. Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.

    f. Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint

2. TRADES FOR DEMONSTRATION:

a. Plumbing

b. Machine Shop

c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

REFERENCE BOOKS:
1. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009
2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/e Vikas
4. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.

I.T. WORKSHOP

Objectives:
The IT Workshop for engineers is a training lab course. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.

PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. **The students should work on a working PC (PIV or higher)to disassemble and assemble back to working condition and install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.**

Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace for usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

Productivity tools module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal

web sites using the Microsoft suite of office tools and LaTeX. (**It is recommended to use Microsoft office 2007 in place of MS Office 2003**)

PC Hardware

Exercise 1 – Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit <u>to your instructor</u>.

Exercise 2 – Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video shall be given as part of the course content.

Exercise 3 – Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Exercise 4 – Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Exercise 5 – Task 5: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Exercise 6 – Task 6: Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

OFFICE TOOLS
LaTeX and Word

Exercise 7 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in

each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 1 : Using LaTeX and Word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Excel

Exercise 8 - Excel Orientation: The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

LaTeX and MS/equivalent (FOSS) tool Power Point

Exercise 9 - Task1: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this Exercise includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Powerpoint. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Exercise 10 - Task 2 : Second Exercise helps students in making their presentations interactive. Topic covered during this Exercise includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

Internet & World Wide Web
2 Exercises

Exercise 11 - Task 1: **Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In

the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers.

Exercise 12 - Task 2: **Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated by the student to the satisfaction of instructors.

Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install an anti virus software, configure their personal firewall and windows update on their computer.

REFERENCES :

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. LaTeX Companion – Leslie Lamport, PHI/Pearson.
3. Introduction to Computers, Peter Norton, 6/e Mc Graw Hill
4. Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education
5. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dreamtech
6. IT Essentials PC Hardware and Software Companion Guide, Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year (Aero.E)

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(9ABS106) ENGINEERING PHYSICS LAB and ENGINEERING CHEMISTRY LAB

ENGINEERING PHYSICS LAB

Any <u>TEN</u> of the following experiments are to be performed during the Academic year.

Sl.No.   Name of the Experiment

1. Determination of wavelength of given source – spectrometer – normal incidence   method.
2. Dispersive power of the prism – Spectrometer.
3. Determination of wavelength of a laser source - Diffraction Grating.
4. Determination of particle size by using a laser source.
5. Determination of thickness of a thin wire using parallel fringes.
6. Newton's Rings.
7. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
8. Numerical aperture of an optical fiber.
9. Hall effect.
10. B – H Curve.
11. Energy gap of a material of p-n junction
12. Determination of rigidity modulus of a wire material – Torsional pendulum
13. Determination of dielectric constant.
14. Verification of laws of stretched string – Sonometer.
15. Melde's experiment – Transverse & Longitudinal modes.

<u>Equipment required:</u>

Spectrometer, Grating, Prism, Mercury vapour lamp, Sodium vapour lamp, Travelling Microscope, Wedge arrangement, Newton rings setup, Stewart-Gee's apparatus, He-Ne laser source, Optical fiber, Hall effect kit, B-H loop

kit, Energy gap kit (four probe method), Torsional pendulum, Dielectric constant kit, Sonometer, Melde's apparatus

ENGINEERING CHEMISTRY LAB

1. Preparation of Standard Potassium Dichromate and Estimation of Ferrous Iron.
2. Preparation of Standard Potassium Dichromate and Estimation of Copper, by Iodometry.
3. Preparation of Standard EDTA solution and Estimation of Hardness of Water.
4. Preparation of Standard EDTA and Estimation of Copper
5. Determination of Manganese in Steel and Iron in Cement.
6. Determination of strength of the given Hydrochloric acid against standard sodium hydroxide solution by Conducto metric titration
7. Determination of viscosity of the oils through Redwood viscometer
8. Determination of calorific value of fuel using Bomb calorimeter
9. Estimation of dissolved oxygen
10. Determination of Eutectic Temperature of binary system (Urea – Benzoic Acid)

BOOKS:
1. Chemistry-lab manual by Dr K.N.Jayaveera and K.B. Chandra Sekhar, S.M. Enterprizes Ltd.
2. Vogel's Book of Quantitative Inorganic Analysis, ELBS Edition.

Equipment Required:
1. Glass ware: Pipettes, Burettes, Volumetric Flasks, Beakers, Standard flasks, Measuring jars, Boiling Test tubes, reagent bottles, (Borosil)
2. Analytical balance (keroy) (15 Nos)
3. Calorimeter
4. Bomb Calorimeter
5. Redwood viscometer No.1& No.2
6. Conductometer/ Conductivity bridge
7. Wash bottles, test tube stands, burette stands
8. Gas cylinders with Bunsen burners
9. Chemicals: Hydrochloric acid, sodiumhydroxide, EDTA, EBT indicator, fast sulfon black-f, urea, benzoic acid, methanol, Mohr's salt, copper sulphate, magnesium sulphate, ammonia, ammonium sulphate, calcium sulphate etc.,

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**(9ABS107) ENGLISH LANGUAGE AND COMMUNICATION SKILLS
LAB**

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

Objectives:
1. To train students to use language effectively in everyday
   conversations, to participate in group discussions, to help them face
   interviews, and sharpen public speaking skills
2. To expose the students to a varied blend of self-instructional, learner-
   friendly modes of language learning
3. To enable them to learn better pronunciation through stress on word
   accent, intonation, and rhythm
4. To initiate them into greater use of the computer in resume
   preparation, report- writing, format-making etc.
5. To help the students cultivate the habit of reading passages from the
   computer monitor, thus providing them with the required ability to
   face computer-based competitive exams such GRE, TOEFL, GMAT
   etc.

SYLLABUS :
The following course content is prescribed for the **English Language
Laboratory** sessions:

1. Introduction to the Sounds of English- Vowels, Diphthongs &
   Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues (giving directions etc.)
4. Speaking on the mobiles and telephone conversation
5. Role Play.
6. Oral Presentations- Prepared and Extempore.
7. 'Just A Minute' Sessions (JAM).
8. Describing Objects / Situations / People.

9. Information Transfer
10. Debate

Minimum Requirement:

The English Language Lab shall have two parts:

i) **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

ii) **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

System Requirement (Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

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

PRESCRIBED SOFTWARE: GLOBARENA

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- The Rosetta Stone English Library
- Clarity Pronunciation Power – Part I
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd with CD
- Learning to Speak English - 4 CDs
- Microsoft Encarta with CD
- Murphy's English Grammar, Cambridge with CD
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. **English Pronouncing Dictionary,** Daniel Jones Current Edition with CD.
2. **Spoken English**, R. K. Bansal and J. B. Harrison, Orient Longman 2006 Edn.
3. **Speaking English Effectively,** Krishna Mohan & NP Singh (Macmillan)
4. **A Practical Course in English Pronunciation**, (with two Audio cassettes) by J. Sethi, Kamlesh   Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
5. **Body Language- Your Success Mantra , Dr Shalini Verma, S.Chand & Co, 2008**
6. **English Dictionary for Advanced Learners,** (with CD) International edn. Macmillan 2009
7. **A Handbook for Englsih language Laboratories,** E.Sureshkumar, P.Sreehari, Foundation Books, 2009
8. **DELTA's key to the Next Generation TOEFL Test,** 6 audio CDS, New Age International Publishers, 2007

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B.Tech. II-I Sem (Aero.E)　　　　　　　　　**T　P　C**
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(9ABS301) MATHEMATICS – II

(Common to Civil, Mech. Bio-Tech, Aero.Engg)

UNIT – I

Matrices: Elementary row transformations – Rank – Normal form – Echelon form – Consistency – Solution of system of simultaneous linear homogeneous and non-homogeneous equations. Eigen values, Eigen vectors – Properties – Cayley-Hamilton Theorem – Inverse and powers of a matrix by Cayley-Hamilton theorem

UNIT – II

Symmetric, skew – Symmetric, Orthogonal, Hermitian, Skew Hermitian and unitary matrices and their properties - Quadratic forms – Reduction of quadratic forms to canonical form and their nature.

UNIT – III

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd period, continuation – Half-range Fourier sine and cosine expansions.

UNIT – IV

Fourier integral theorem – Fourier sine and cosine integrals.　Fourier transforms – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

UNIT – V

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

UNIT – VI

Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

Interpolation: Introduction – Newton's forward and backward interpolation formulae – Lagrange's Interpolation formula.

UNIT – VII

Curve fitting: Fitting a straight line – Second degree curve – Exponential curve-Power curve by method of least squares. Numerical Differentiation and Integration – Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

UNIT – VIII

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Method – Predictor-Corrector Method – Milne's Method.

TEXT BOOKS:
1. A Text Book of Engineering Mathematics, Vol–II, T.K.V. Iyengar, B. Krishna Gandhi and Others S. Chand & Company.
2. A Text Book of Engineering Mathematics, C. Sankaraiah, V.G.S. Book Links.
3. A Text Book of Engineering Mathematics, P. Nageshwara Rao, Y. Narasimhulu & N. Prabhakar Rao, Deepthi Publications.

REFERENCES:
1. A Text Book of Engineering Mathematics, B.V. Raman, Tata Mc Graw Hill.
2. Engineering Mathematics, Sarveswara Rao Koneru, Universities Press.
3. Introduction to Numerical Analysis Using MATLAB – Butt – Firewall Media.
4. Introduction to Numerical Analysis – S.S. Sastry. PH – I

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B.Tech. II-I Sem (Aero.E)   **T   P   C**

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(9A01301) MECHANICS OF SOLIDS
(Common to Mech., Aero.Engg)

UNIT – I

SIMPLE STRESSES & STRAINS : Elasticity and plasticity – Types of stresses & strains–Hooke's law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses.-Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT – II

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

UNIT – III

FLEXURAL STRESSES : Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis –Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T , Angle and Channel sections – Design of simple beam sections.

UNIT – IV

SHEAR STRESSES : Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT – V

TORSION OF CIRCULAR SHAFTS- Theory of pure torsion- Derivation of torsion equations; $T/J=q/r=N_0/l$ – Assumptions made in the theory of pure torsion- torsional moment of resistance- polar section modulus.

SPRINGS- Introduction- types of Springs – deflection of closed and open coil helical springs under axial pull and axial couple – Springs in series and parallel- carriage or leaf springs

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

UNIT – VII
THIN CYLINDERS : Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

UNIT – VIII
Thick cylinders–lame's equation – cylinders subjected to inside & out side pressures – compound cylinders.

TEXT BOOKS :
 1. Strength of materials by Bhavikatti, Lakshmi publications.
 2. Solid Mechanics, by Popov

REFERENCES :
 1. Strength of Materials -By Jindal, Umesh Publications.
 2. Analysis of structures by Vazirani and Ratwani.
 3. Mechanics of Structures Vol-III, by S.B.Junnarkar.
 4. Strength of Materials by S.Timshenko
 5. Strength of Materials by Andrew Pytel and Ferdinond L. Singer, Longman.

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**(9A02301) ELECTRICAL ENGINEERING AND
ELECTRONICS ENGINEERING**
(Common to Mech. Aero.Engg)

PART-A-ELECTRICAL ENGINEERING

UNIT - I
ELECTRICAL CIRCUITS: Basic definitions, Types of elements, Ohm's Law, Resistive networks, Kirchoff's Laws, Inductive networks, capacitive networks, Series, Parallel circuits and Star-delta and delta-star transformations.

UNIT - II
DC MACHINES : Principle of operation of DC Generator – emf equation - types – DC motor types – torque equation – applications – three point starter.

UNIT - III
TRANSFORMERS : Principle of operation of single phase transformers – emf equation – losses – efficiency and regulation

UNIT - IV
AC MACHINES : Principle of operation of alternators – regulation by synchronous impedance method –Principle of operation of induction motor – slip – torque characteristics – applications.

TEXT BOOKS:
1. Fundamentals of Electrical and Electronics Engineering by T. Thyagarajan, 5th Edition, SCITECH Publications, 2007.
2. Fundamentals of Electrical Engineering and technology by William D Stanley,John R. Hackworth, Richard L Jones – Thomson Learning
3. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand & Co.

REFERENCES:
1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering by Kothari and Nagarath, TMH Publications, 2nd Edition.

PART-B-ELECTRONICS ENGINEERING

UNIT-V
DIODE AND ITS CHARACTERISTICS:
PN Junction diode, Symbol, V-I characteristics, Diode Applications, Rectifiers-Half Wave, Full Wave and Bridge Rectifiers (Simple Problems).

UNIT-VI
TRANSISTORS
PNP and NPN Junction Transistor, Transistor as an Amplifier, Single Stage CE Amplifier, Frequency Response of CE Amplifier, Concepts of Feedback Amplifier, Necessary conditions for Oscillators, SCR Characteristics and Applications.

UNIT-VII
INDUCTION HEATING: Theory of Induction Heating, Application in Industries.
DIELECTRIC HEATING: Theory of Dielectric heating and its industrial Applications.
ULTASONICS: Generation, Flow Detection and Other Applications.

UNIT-VIII
CATHODE RAY OSCILLOSCOPE
Principles of CRT (Cathode Ray Tube), Deflection Sensitivity, Electrostatic and Magnetic Deflection, Applications of CRO-Voltage, Current and Frequency Measurements.

TEXT BOOKS:
1. Electronic devices and circuits – R.L.Boylestad and Louis Nashelsky, 9th Edition, 2006, PEI/PHI.
2. Industrial Electronics by G.K.Mittal-PHI.
3. Modern Electronic Instrumentation and Measurement Techniques-Albert D.Helfrick, WillamD.Cooper.

REFERENCES:
1. Millman's Electronic Devices and Circuits-J.Millman and C.C.Halkias, Satyabratajit, 2nd Edition, 1998, TMH.
2. Electronic Devices and Circuits-K.Lal Kishore, 2nd Edition, 2005, BSP.

Note: In Electrical Engineering ad Electronics Engineering minimum of two questions form each part should be chosen for answering five questions in the end Semester Examination.

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B.Tech. II-I Sem (Aero.E)   **T P   C**
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(9A03301) MATERIAL SCIENCE AND ENGINEERING
(Common to Mech., Aero.Engg)

UNIT – I
Structure of Metals : Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.

UNIT - II
Constitution of Alloys : Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT -III
Equilibrium of Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, and Fe-Fe$_3$C.

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

UNIT – V
Heat treatment of Alloys: Effect of alloying elements on Iron – Iron carbon system, Annealing, normalizing, Hardening, TTT diagrams, tempering , Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT - VI
Non-ferrous Metals and Alloys : Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT – VII
Ceramic materials : Crystalline ceramics, glasses, cermets.
UNIT - VIII
Composite materials : Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and Carbon – Carbon composites.

TEXT BOOKS :
1. Introduction to Physical Metallurgy, Sidney H. Avener.
2. Essential of Materials Science and Engineering, Donald R.Askeland, Thomson.

REFERENCES :
1. Material Science and Metallurgy, Kodgire.
2. Science of Engineering Materials, Agarwal
3. Materials Science and Engineering, William and collister.
4. Elements of Material science, V. Rahghavan
5. Engineering Materials and Their Applications – R. A Flinn and P K Trojan, Jaico Books.
6. Engineering materials and metallurgy, R.K.Rajput, S.Chand.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. II-I Sem (Aero.E)   **T P C**
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(9A03302) THERMODYNAMICS
(Common to Mech., Aero.Engg)

UNIT – I
Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility, Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition - Types, Work and Heat, Point and Path function.

UNIT II
Zeroth Law of Thermodynamics – Concept of quality of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.

UNIT – III
Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT IV
Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation, Constructional use of Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

UNIT - V
Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes – Deviations from perfect Gas Model – Vander Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables.

UNIT – VI
Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial
pressure, Equivalent Gas const. And Molecular Internal Energy, Enthalpy, specific Heats and Entropy of Mixture of perfect Gases and Vapour.

UNIT - VII
Psychrometry- Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation, Carrier's Equation – Psychrometric chart.

UNIT - VIII
Power Cycles : Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericcson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

TEXT BOOKS :
1. Engineering Thermodynamics, PK Nag, TMH, III Edition
2. Basic Engineering Thermodynamics, A. Venkatesh, Orient Longman

REFERENCES :
1. Fundamentals of Thermodynamics – Sonntag, Borgnakke and Van Wylen, John Wiley & sons (ASIA) Pte Ltd.
2. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles, TMH
3. Thermodynamics – J.P.Holman, McGrawHill
4. An introduction to Thermodynamics, YVC Rao, New Age
5. Engineering Thermodynamics – Jones & Dugan

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(9A21301) AIRCRAFT ENGINEERING DRAWING with CAD

I. Machine Drawing Conventions :

Need for drawing conventions – introduction to IS conventions

a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.

b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.

c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.

d) Title boxes, their size, location and details – common abbreviations & their liberal usage

e) Types of Drawings – working drawings for machine parts.

II. Drawing of Machine Elements and simple parts

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

a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws and bolted joints.

b) Keys, cottered joints and knuckle joint.

c) Rivetted joints for plates

d) Shaft coupling, spigot and socket pipe joint.

e) Journal, pivot and collar and foot step bearings.

f) Welded joints and welding symbols.

III. Assembly Drawings: Following simple aircraft assembly drawings only.

a) Different types of trusses used in wings fuselage including ribs, stringers, skin, briskets

b) Different elements of fuselage structures bulk head, rings (frame) long irons

c) Different types of fuselage.

d) Landing gear basic elements, structural brackets, wheel, shock absorber and hydraulic cylinder

e) Connecting rod for aero piston engine

IV. CAD Drafting: Fundamentals of CAD and Design process. Development of part drawings for various components in the form of orthographic and

isometric. Representation of dimensions and tolerances, scanning and plotting. Study of script, DXE and IGES files.

Part Modelling Generation of various 2D and 3D models through Protrusion, revolution, shell sweep. Surface and Solid assembly modeling. Preperation of working drawings of simple Aircraft components/ machine parts.

NOTE : First angle projection to be adopted. The student should be able to provide working drawings of actual parts in manual as well as CAD support.

TEXT BOOKS :
1. Machine Drawing – Dhawan, S.Chand Publications
2. Machine Drawing includes AutoCAD-Ajeet Singh, Tata McGraw-Hill
3. Daniel P. Raymer Aircraft Design Conceptual Approach Third Addition.

REFERENCES :
1. Textbook of Machine Drawing –K.C.John, 2009, PHI learning
2. Megson THG, "Aircraft Structures for Engineering Students ", Edward Arnold Publi.
3. Air Craft structures by Bruhn.E.H
4. Machine Drawing - K.L.Narayana, P.Kannaiah & K. Venkata Reddy, New Age Publishers

Note: The End exam will be for 3 hrs in the following format.

All questions are to be answered

Q1 – Questions set on section I & II of the syllabus 2 out of 3 or 2 out of 4 to be answered with a weightage of 5 marks each – 10 marks

Q2– Questions set on Section II of the syllabus 2 out of 3 to be answered with a weightage of 10 marks each – 20 marks

Q3 – Drawing of assembled views of Section III items of Syllabus with a weightage of 20 marks

Q4 – Question set on Section IV of Syllabus with a weightage of 20 marks. The question is to be of theoretical nature (not to be run in a Computer system)

Equipment Needed

1. Hardware assembly models relevant to above are needed for demonstration
2. Drawing Boards, Computer systems with latest AutoCAD or any CAD software should be made available
3. Student should be trained in CAD drawing with sufficient number of exercises.

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(9A02302) ELECTRICAL ENGINEERING AND ELECTRONICS ENGINEERING LAB

PART - A: Electrical Engineering Lab:
The following experiments are required to be conducted as compulsory experiments :

1. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors)
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
   a) Armature Voltage control   b) Field flux control method
6. Brake test on D.C Shunt Motor

PART - B: Electronics Engineering Lab:
1. Study of CRO (Measurement of Voltage, Frequency and Phase of periodic signals).
2. V - I characteristics of PN junction Diode.
3. Full wave rectifier with and without capacitive filter.
4. Input and output characteristics of Common Emitter (CE) configuration.
5. Frequency response of a single stage CE amplifier.
6. Sinusoidal signal generation using RC phase shift oscillator circuit.

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(9A03304) MATERIAL SCIENCE LAB AND
MECHANICS OF SOLIDS LAB

(A) MATERIAL SCIENCE LAB :

Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.

Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.

Study of the Micro Structures of Cast Irons.

Study of the Micro Structures of Non-Ferrous alloys.

Study of the Micro structures of Heat treated steels.

Hardeneability of steels by Jominy End Quench Test.

To find out the hardness of various treated and untreated steels.

(B) MECHNICS OF SOLIDS LAB :

Direct tension test

Bending test on

       a)   Simple supported beam

       b)   Cantilever beam

Torsion test

Hardness test

      Brinells hardness test

      Rockwell hardness test

Test on springs

Compression test on cube

Impact test

Punch shear test

Note: Internal and End examinations evaluation will be done separately for each lab and the average will recorded.

Equipment needed

MATERIAL SCIENCE LAB

      Metallurgical microscopes
      Metallurgical specimen preparation equipment.
      Hardness testing equipment
      Jominy test equipment
      Different metal specimen

MOS – lab

1. UTM – 20 / 40 Tons with load Vs Elongation graphical attachment and provision for Bending and sheering along with accessories and end grips
2. Deflection test rig (Fabricated hardware + precession dial gauge)
3. Torsion testing Machine
4. Spring testing Machine.

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(9A21401)INTRODUCTION TO AEROSPACE ENGINEERING

UNIT- I HISTORY OF FLIGHT
Balloons and dirigibles, heavier than air aircraft, commercial air transport, introduction of jet aircraft, helicopters, conquest of Space. Commercial use of Space, exploring Solar system and beyond. Permanent presence of humans in Space.

UNIT- 11 INTRODUCTION TO ENGINEERING
The ages of engineering, the Bronze Age, Iron Age, the Middle Ages, the renaissance, the industrial revolution, Indian science and technology through the ages.

UNIT –III AERODYNAMICS AND FLIGHT VEHICLE PROPULSION
Aerodynamic forces on a wing, force coefficients. Generating lift. Moment coefficients. Centre of pressure, aerodynamics of wings. Sources of drag. Thrust for flight, the propeller and the jet engine, governing equations, rocket engines.

UNIT-IV FLIGHT VEHICLE PERFORMANCE AND STABILITY
Anatomy of the airplane, helicopter, launch vehicles and missiles, space vehicles. Static forces and moments on the vehicle. Understanding engineering models. Performance parameters, performance in steady flight, accelerated flight. Stability, Static stability, Dynamic stability. Longitudinal and Lateral stability.

UNIT –V THE SPACE ENVIRONMENT
Earth's atmosphere, the standard atmosphere. The temperature extremes of space, laws of gravitation, low earth orbit, microgravity, benefits of microgravity. The near earth radioactive environment. The magnetosphere. Environmental impact on spacecraft. Meteoroids and micrometeoroids, space debris. Planetary environments.

UNIT –VI SATELLITE SYSTEMS ENGINEERING

Satellite missions, an operational satellite system, elements of satellite. Satellite bus subsystems. Satellite structures, mechanisms and materials. Power systems. Communication and telemetry. Thermal control. Attitude determinations and control. Propulsion and station keeping. Space missions. Mission objectives. Case studies

UNIT-VII HUMAN SPACE EXPLORATION

Goals of human space flight missions. Historical background. The soviet and US missions. The mercury, Gemini, Apollo (manned flight to the moon), Skylab, Apollo-Soyuz, Space Shuttle. International Space Station, extravehicular activity, The space suit. The US and Russian designs. Life Support systems. Flight safety. Indian effort in aviation, missile and space technology.

UNIT –VIII ENGINEERING DESIGN

Design as a critical component of engineering education. Design as a skill. The design process, design thinking and design drawing. Design for mission, performance and safety requirements. Concurrent engineering. Computer aided engineering, design project. Example: the lighter-than – air vehicle student design project of MIT.

TEXT BOOKS

1. Interactive Aerospace Engineering and Design, (with software and   re reference material on CD), Newman , D., McGraw-Hill, 2002,ISBN 0-07-112254-0
2. Aircraft Flight, Barnard, R.H. and Philpot, D.R., Pearson, 3/e, 2004, ISBN: 81-297-0783-7.
3. Introduction to Flight, Anderson, J.D., Tata Mc Graw-Hill, 5/e, 2007, ISBN: 0-07-006082-4

REFERENCES:

1. Numerous references cited in Newman's book
2. NASA Education Home page, http:// WWW.ne.nasa.gov/ education.
3. The Wikipedia: Transportation Systems, Air Transportation, And Aviation.

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(9ABS303) ENVIRONMENTAL SCIENCE
(Common to Mech., Aero.Engg)

UNIT – I
MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES :
– Definition, Scope and Importance – Need for Public Awareness.

UNIT – II
NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

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

UNIT – IV
BIODIVERSITY AND ITS CONSERVATION : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical 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-soports 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.

UNIT – V
ENVIRONMENTAL POLLUTION : Definition, Cause, effects and control measures of :

      a.   Air Pollution.
      b.   Water pollution
      c.   Soil pollution
      d.   Marine pollution
      e.   Noise pollution
      f.   Thermal pollution
      g.   Nuclear hazards

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

UNIT – VI
SOCIAL ISSUES AND THE ENVIRONMENT: 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 – 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.

UNIT – VII
HUMAN POPULATION AND THE ENVIRONMENT : Population growth, variation among nations. Population explosion – Family Welfare Proggramme. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

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

TEXT BOOKS :
1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by R.Rajagopalan, Oxford University Press.
3. Environmental Studies by Benny Joseph,McGraw Hill Publications.

REFERENCES :
1. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
4. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.
5. Environmental Studies by Aninita Basak – Pearson Education.

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(9A21402) AEROSPACE VEHICLE STRUCTURES-I

UNIT-I
REDUNDANT STRUCTURES
Indeterminate structures and order of redundancy, Introduction to redundant analysis, statically determinate models, Use of free body diagrams to explain compatibility and redundant analysis principles. Matrix methods of redundant analysis utilizing (a) equilibrium equations/compatibility conditions and (b) Singularity method for uniform beams with various boundary and support conditions (props, hinges and fixities) subjected to distributed/ discrete loads (including moments).

UNIT-II
BEAMS WITH ELASTIC SUPPORTS AND INITIAL CURVATURE:
Direct solution of beams on elastic foundation, Deflection of beams with discrete elastic supports using singularity methods and modeling concepts. Equation of equilibrium for curved beam stress and deflections of a typical curved beam (Bulk Head segments on fuselages).

UNIT III
STABILITY
Stability of Structural systems, Modes of instability of columns. Euler's formula for critical loads of column. Slenderness ratio, Effect of boundary conditions on mode shapes and critical loads. Column with initial curvature, effect of eccentricity. Long, medium and short column ranges. Eigen values and Eigen modes. Effect of intermediate supports. Concept of beam column.

UNIT –IV
INTRODUCTION TO THEORY OF ELASTICITY
Equilibrium and Compatibility conditions for elastic solids.2D elasticity equations for plane stress, plane stress, plane strain and generalized plane strain cases Air's stress function. Simple problems in plane stress /plane strain using Cartesian and polar coordinates. Super position techniques Examples include (a) panels subjected to a generalized plane strain Biaxial loading (b) Uniform/ Linearly varying edge loads o elastic half plane (c) Thick cylindrical shells.

UNIT-V
Stresses and Strains on arbitrary planes and transformations. Concept of principle planes, stress and Strains, Construction of Mohr's circle, Failure mechanism and fracture modes.

UNIT-VI
ENERGY PRINCIPLES AND METHODS

Introduction to energy principles and methods. Principles of virtual Displacement and principle of virtual Force Castilian's theorems, Maxwell's reciprocal theorem and unit load method. Direct application of energy principles to beams and trusses.

UNIT-VII
The displacement method(Rayleigh Ritz method). Admissible functions energy and expressions for redundant analysis of !-D structures((rods,shafts and beams). Various 1D structures subjected to complex loading. Stresses of errors and convergence.

UNIT-VIII
SHEAR FLOW IN CLOSED SECTIONS
Bredt- Batho formula. Single and multi-cell closed box structures. Semi monocoque and Monique structures. Approximate method for box beams. Shear flow in single and multicell monocoque and semimonocoque box beams subject to torsion.

TEXT BOOKS:
1. "Theory of Elasticity" Timoshenko S.P.and J.N. Goodier, McGraw Hill Book Co.
2. " Aircraft Structures for Engineering students", Megson THG, Edward Arnold publication.
3. "Aircraft Structures", David J.Peery McGraw-Hill Book Company.

REFRENCES
1. Energy and finite element methods structural analysis, Shames I.H. and Dym C.L, McGraw Hill
2. "Theory of Structures", B.C.punmia,Laxmi publication.
3. "Theory of Structures", S.Ramamrutham, R.Narayanan, Dhanpat Rai publ. Co, 2003

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4. Energy theorems and structural analysis, Argyrols J.H.and Kelsey S.,Butterworth's Scientific Publications.1960
5. Analysis of Aircraft Structues –An introduction, Donaldson B.K.,McGraw Hill.
6. Introduction to Aeronautical Structure Analysis, David H.Allen and Walter E. Haiseler, John Wiley & Son, 1985.

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(9A21403) AERODYNAMICS-I

Tables, plots required to be supplied to candidates for reference during examination

- *Typical three bladed propeller charts as follows.*
- *1. Propeller geometry:*
- *2,3,4, VI/nD vs C_T , C_p , η:*
- *5. C_s vs Ç*

UNIT –I

REVIEW OF FLUID MECHANICS

Aerodynamics – importance, the flow field, fundamental aerodynamic variables, aerodynamic force & moment coefficients, dimensional analysis, flow similarity, classification of fluid flows. Continuity, Momentum and Energy equations in integral form and in differential form. Euler's equation. Methods of determination of flow – analytical and numerical methods.

UNIT –II
INVISCID, INCOMPRESSIBLE FLOW

Angular velocity, vorticity and circulation. Kelvin's theorem. Irrotational flow. The velocity potential. Stream function for two dimensional incompressible flow. Laplace's equation. Boundary conditions at infinity and at the wall. Elementary flows and their combinations, non-lifting flow over a circular cylinder, vortex flow, lifting flow over a cylinder. D'Alembert's paradox. Kutta Joukowski theorem and generation of lift. Non-lifting flows over arbitrary bodies- numerical source panel method. Real flow over a circular cylinder.

UNIT-III
VISCOUS FLOW AND BOUNDARY LAYERS

Role of viscosity in fluid flow. The Navier- Stokes equation, boundary layer approximation. Boundary layer thicknesses, growth along a flat surface. Laminar boundary layers. Surface friction drag. Boundary layer separation. Transition, Turbulent boundary layers. Turbulence modeling, eddy viscosity

and mixing length concepts. The momentum integral equation. Approximate solutions for laminar, turbulent and mixed boundary layers- computational methods. Thermal boundary layer. Reynolds' analogy.

UNIT –IV
INCOMPRESSIBLE FLOW OVER AIRFOILS
Theoretical solutions of low speed flow over airfoils- the vortex sheet representation. The Kutta condition. Kelvin's circulation theorem and the starting vortex. The thin airfoil theory. The aerodynamic centre. Lifting flows over arbitrary bodies- the vortex panel numerical method. Airfoil design for prescribed lift distribution. Real flow over an airfoil. Effect of boundary layer transition and surface roughness on the aerodynamic forces.

UNIT –V:
INCOMPRESSIBLE FLOW OVER WINGS & BODIES- I
Downwash and induced drag. The vortex filament –Biot- Savart's law, Helmholtz's theorems. The starting, bound and trailing vortices. Prandtl's classical lifting line theory for upswept wings - determination of lift, vortex induced drag. Nonlinear lifting-line, lifting surface and vortex lattice. Numerical methods.

UNIT-VI:
INCOMPRESSIBLE FLOW OVER WINGS AND BODIES-II
The mechanism of lift generation on delta wing in subsonic flow. Leading edge extensions to wings. Three dimensional flow- source, doublet, flow over a sphere. General three dimensional flows- panel techniques. Real flow over a sphere. Asymmetric loads on fuselage at high angles of attack – asymmetric vortex shedding, wake-like flows. Flow field about aircraft at high angles of attack.

UNIT –VII
AERODYNAMIC CHARACTERISTICS OF AIRFOILS AND WINGS
Aerodynamic force and moment coefficients. The drag polar. The lift curve slope, maximum lift coefficients, minimum drag coefficient, lift drag ratio – effect of airfoil and wing geometry parameters, Reynolds' number, boundary layer transition and surface roughness. NACA airfoils, laminar flow airfoils, supercritical airfoils. Aerodynamics of drag reduction and lift augmentation methods- flap systems. Leading edge devices, multi- element airfoils, power augmented lift, circulation control, laminar flow control, winglets.

UNIT –VIII
PROPELLERS
Geometry of the propeller, Rankine- Froude momentum theory of propulsion, airscrew coefficients, thrust, torque, power coefficients, propulsive efficiency, activity factor , airscrew pitch; geometric pitch , experimental mean pitch, effect of geometric pitch on airscrew performance, blade element theory, the vortex system of an airscrew, rotational inflow and out flow, performance of a blade element, compressibility effects, use of propeller charts, propeller selection. Propeller design.

TEXT BOOKS
1. Aerodynamics for Engineers, Bertin,J.J., 4/e, Pearson Education , 2002, ISBN: 81-297-0486-2
2. Fundamentals of Aerodynamics, Anderson,jr.,J.D., International edition, Mc Graw-
3. Hill, 2001, ISBN: 0-07-118146-6.
4. Foundations of Aerodynamics, Kuethe, A.M., and Chow C., 5/e, Wiley, 1998, ISBN: 0-471-12919-4.

REFERENCES
1. The Aerodynamic Design of Aircraft, Kuchemann. D., Pergamon, 1978.
2. Fundamentals of Flight, Indian reprint, . Shevell, R.S.,Pearson Education, 2004, ISBN:81-297-0514-1.
3. Aerodynamics, Aeronautics & flight Mechanics, McCormick, B.W., 2/e, John Wiley, 1995, ISBN: 0-471-57506-2.

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(9A21404) MECHANICS OF FLUIDS

UNIT-I
Fluid properties And Fluid Statics: Density, Specific weight, Specific gravity, viscosity, Vapour pressure, compressibility, pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Hydrostatic law, piezometer, simple and differential manometers, pressure gauges, total pressure and center of pressure of plane, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT II
Fluid kinematics: Stream line, path line, streak line, stream tube. Classification of flows: steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows. One, Two and Three dimensional flows. Continuity equation in 3D flow, stream function, velocity potential function.

UNIT III
Fluid Dynamics: Surface and Body forces. Euler's and Bernoulli's equations derivation, Navier–Stokes equation (explanation only). Momentum equation-application, free and forced vortex. Forced vortex with free surface.

UNIT –IV
Similitude and Flow Measurement: Similarity laws, distorted models. Flow measurement through Venturimeters and Orifice meter. Flow through notches and weirs, Viscometers, Pitot tube, Hotwire Anemometers, flow through nozzles.

UNIT V
Approximate solutions of N.S. Equations- Boundary layer- concepts, Prandtl contribution, Characteristic's of boundary layer along a thin flat plate Von-karman's momentum integral equation (No derivation), laminar and turbulent Boundary layers, BL in transition, separation of BL, control of BL separation, flow around submerged objects, Drag and lift types of drag, Magnus effect.

UNIT –VI
Closed conduit flow: Characteristics of real fluids. Reynolds experiment. Darcy's equation. Minor losses in pipes in series and parallel. Total energy line and hydraulic gradient line.

UNIT VII
Exact solutions of Navier Stokes Equations. Flow between parallel plates. Flow through long tubes- Flow through inclined tubes, Turbulent flow, and variation of friction factor with Reynolds Number. Moody's chart

UNIT VIII
Flow of compressible Fluid: Introduction, Thermodynamic relations, basic equations of compressible flow, velocity of sound wave in a fluid for isothermal and adiabatic process, Mach number and its applications, Mach angle, propagation of pressure waves and stagnation properties

TEXT BOOK
1. Fluid Mechanics Hydraulics and Hydraulics Machines, Modi & Seth, Standard Publications, New Delhi.
2. Engineering Fluid Mechanics by K.L.Kumar, S.Chand &Co.

REFERENCES:

1. Fluid Mechanics, Frank M. White, Tata Mc-Grawhill.
2. Fluid Mechanics, John F.Dauglas, Pearson Educations publishers
3. Fluid Mechanics & Hydraulic Machines, D. Ramadurgaiah, New age publishers2005.

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(9A21405) AIRCRAFT PRODUCTION TECHNOLOGY

UNIT-I
INTRODUCTION

Classification and comparison (merits and limitations) of manufacturing process, criterion for selection of a process. General principles of various Casting processes- Sand casting, die casting, centrifugal casting, investment casting, shell molding types

UNIT-II
WELDING AND BONDING TECHNIQUES

Principles and equipment used in arc welding, gas welding , resistance welding, thermit welding, recent advances in welding technology, Soldering and brazing techniques.

UNIT –III
MACHINING

General Principals (with schematic diagram only) of working and types-lathe, shaper, milling machine, grinding, drilling machine, CNC machining.

UNIT –IV
SHEET METAL FORMING

Sheet metal operations-shearing, punching, dropstamp forming, Advanced metal forming (super plastic forming and diffusion bonding). Bend correction for bending in a single plane, Automation in bend forming and different operations in bending like stretch forming, spinning, drawing etc.

UNIT-V
UNCONVENTIONAL MACHINING

Principles (with schematic diagram only) of working and applications of abrasive jet machining, ultrasonic machining, electric discharge machining, electro chemical machining, laser beam/electron beam/ plasma arc machining

UNIT-VI
HEAT TREATMENT AND SURFACE FINISHING

 Heat treatment of Aluminum alloys, steels, case hardening, Initial stresses and the stress alleviation procedures. Corrosion prevention, protective treatment for

aluminum alloys, steels, anodizing of titanium alloys, organic coating. Thermal spray coatings. Grinding and polishing, Burnishing, Lapping.

UNIT –VII
AIRCRAFT ASSEMBLY
Aircraft Tooling Concepts, jigs, fixtures, stages of assembly, types and equipment for riveted joints and bolted joints (only).

UNIT –VIII
QUALITY CONTROL AND ASSURANCE
Concepts and definitions of quality, reliability, quality circles, zero defect program; international standards, six- sigma quality

NDT AND OTHER INSPECTION TECHNIQUES
Dye Penetrant Text, X-ray, magnetic particle and ultrasonic testing. Acoustic holography.

TEXT BOOKS
1. "Air craft production techniques "Keshu S.C, Ganapathy K.K., Interline publishing House, Banglore- 1993
2. "Manufacturing Engineering and Technology" by Kalpakajam- Addison Wesley.

REFERENCES:
1. "Production technology"- R.K.Jain –Khanna publishers-2002.
2. "Production technology"- O.P.Khanna and M.lal., Dhanpat rai publications- New
   Delhi- 1997

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(9A21406) FLUID MECHANICS LAB and AERODYNAMICS LAB

MECHANICS OF FLUIDS LAB
1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouthpiece by variable head method.
5. Calibration of contracted Rectangular Notch
6. Calibration of contracted Triangular Notch
7. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
8. Verification of Bernoulli's equation.

Note : Any 6 of the above experiments are to be conducted.

AERODYNAMICS LAB
1. Fluid flow studies using blower
2. Calibration of low speed wind tunnel
3. Drag of different bodies
4. Pressure distribution studies on two-dimensional models
5. Pressure distribution over an airfoil at different angles of attack
6. Aerodynamic Characterization on NACA - 0012 Air Foil
7. Axial Flow Compressor
8. Centrifugal Flow Compressor
9. Flow Visualization Techniques.

Note : Any 6 of the above experiments are to be conducted.

Equipment needed

MOF – lab
1. Venturimeter test rig
2. Test rig for Flow over notch
3. Pipe friction apparatus
4. Bernoulli's apparatus
5. Test rig for Orifice meter
6. Mouthpiece apparatus.

AERODYNAMICS LAB

1. Low Speed Wind-tunnel Test Rig with a test section of 1 meter X 1 meter with necessary   accessories.
2. Test Rig for Axial flow Compressor
3. Test rig for centrifugal flow compressor.

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(9A21407) AIRCRAFT PRODUCTION TECHNOLOGY LAB

Basic Exercises on Lathe, Shaper, Milling, Slotting, EDM, CNC and Grinding machines welding equipment

PRODUCTION LAB

Minimum of 12 Exercises need to be performed

1. Plain Turning, Taper turning, Facing, Knurling, Thread Cutting on Lathe
2. Drilling, boring, counter boring, counter sinking on Radial drilling machine
3. Shaping and planning of square blocks, V-ways and Dovetail ways
4. Plain and Gear Milling
5. Sheet metal joining by rivets, Soldering and brazing
6. Simple exercises in solid State Welding, Gas Welding and Arc Welding

The following are for demonstration and exposure to the student
1. Cylindrical Grinding/Surface Grinding
2. Simple exercises in EDM.
3. Simple exercises on CNC machines and programme generation.

REFERENCE:
1. "Air craft production techniques" Keshu S.C, Ganapathy K.K., Interline publishing House, Banglore-1993
2. "Manufacturing Engineering and Technology" by Kalpakajam-Addison Wesley

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B.Tech. III -I Sem (Aero.E)   **T   P   C**
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(9A21501) MATHEMATICS FOR AEROSPACE ENGINEERS
UNIT -I
SPECIAL FUNCTIONS: Gamma and beta functions and their properties. Evaluation of improper integrals. Bessel functions – Properties – Recurrence relations. Orthogonality of Bessel functions. Legendre functions –Legendra Polynomials- properties-recurrence relations. Orthogonality of Legendre polynomials- Rodrigue's formula

UNIT- II
Functions of a complex variable –continuity-differentiability –analyticity-properties of analytic functions. Cauchy – Riemann equations in Cartesian and polar co- ordinates .Harmonic and conjugate harmonic functions. Milne – Thomson method, complex integration.

UNIT- III
Line integral – evaluation along a path and by indefinite integration – Cauchy integral theorem- Cauchy integral formula. Generalized integral formula- zero-singular point- isolated singular point – pole of order, m – essential singularity

UNIT- IV
Complex power series: radius of convergence – Expansion in Taylor's series , Maclaurins series and Laurent's series. Residue: Evaluation of residue by formula and by Laurent series – Residue theorem –Evaluation of Integrals of type $\int f(\cos\theta, \sin\theta) \, d\theta$, $\int f(x) \, dx$, $\int e^{imx} f(x) \, dx$; Argument principle- Rouche's theorem – fundamental theorem of algebra. Liou ville's theorem

UNIT- V
Conformal mapping, Transformation by e^z , $\log_e z$, z^n , sinz ,cosz , z+ (n/z). Bilinear transformation – fixed point, cross ratio, properties, invariance of cross ratio under bilinear transformation. Determination of bilinear transformation mapping 3 given points.

UNIT- VI
Tensor analysis: Introduction to tensor analysis. Summation to convention- co –variant and contravariant tensors- Fundamental and reciprocal tensors and Christoffel symbols.

UNIT-VII
STATISTICS: Sample space and events – probability, the axioms of probability –some elementary theorems- conditional probability- Baye's theorem

UNIT - VIII
Introduction to random variables – discrete and continuous- discontinuous functions. Binomial, Poisson and normal distributions and related properties, mean, standard deviation, auto and cross correlations.

TEXT BOOKS:
1. A text book of engineering mathematics vol iv-2004, T.K.Iyengar, B.Krishna Gandhi & Others, S.Chand and company.
2. Engineering Mathematics, B.V.Ramana by Tata Mc-Grawhill.

REFERENCES:
1. Fundamentals of Mathematical statistics, S.C. Gupta and VK Kapoor.
2. Matrix – Tensor methods in Continuum Mechanics, Brog .S.F., D-VAN Nostrand company.

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

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B.Tech. III -I Sem (Aero.E)   **T   P   C**
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(9A21502) FLIGHT MECHANICS – I

UNIT-I
AERODYNAMIC CHARACTERISTICS
Airfoils, wings and bodies: geometry, nomenclature. Aerodynamic characteristics. Effect of geometry, Reynolds number, Mach no. Measures of aerodynamic performance. Performance augmentation methods.

UNIT –II
DRAG AND THRUST EVALUATIONS
Drag of aerospace vehicle components. Total drag estimation, Methods of drag reduction, Propellers, Performance analysis. Aerospace engines reciprocating, turbine and rockets. Design features. Performance characteristics.

UNIT –III
AIRCRAFT PERFORMANCE IN STEADY FLIGHT
Level flight, Stall, Cruise, Maximum speed, Ceiling, Cruise climb, Range and endurance. Climb performance, Performance optimization.

UNIT-IV
PERFORMANCE IN ACCELERATED FLIGHT
Take-off and landing. Level turns and maneuvers.

UNIT-V
PERFORMANCE OF ROCKETS AND MISSILES
Principal design features of rockets and missiles. Types, Applications, Staging, Launch and Climb. Performance in boost glide, boost sustain, long range cruise and long - range ballistic trajectories.

UNIT-VI
Introduction to Flight path and performance optimizations.

UNIT-VII
Introduction to Sonic boom and hazards of Transonic and Supersonic Flight. Flight path control based on Ground noise considerations.

UNIT-VIII
Rigid Body Mechanics relevant to Aircrafts, space crafts and Missiles.

TEXT BOOKS
1. Aircraft Performance and Design, Anderson, J .D., Mc Graw-Hill International Edition 1999
2. Aerodynamics, Clancy, L.J., Pitman, 1986

REFERENCES:
1. Airplane Performance and Stability and Control, Perkins, C.D., and Hage, R.E., Wiley Toppan, 1974
2. Theoretical Aerodynamics, . Milne Thomson, Macmillan, 1985
3. Aerodynamics for Engineering Students, Houghton, E.L., and Carruthers, N.B., Edward Arnold Publishers Ltd., London, 1989
4. Missile Configuration Design, Chin SS, Mc Graw Hill, New York, 1961.
5. Mechanics of flight, R.H. Bernard, A.C.Kermude, Dr. Philpott 11/e, Pearson, HL.

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(9A21503) AERODYNAMICS – II

Tables/Codes: Isentropic Expansion, Normal Shock, Oblique Shock.

UNIT-I
ONE DIMENSIONAL FLOWS
Isentropic process for closed system/flow processes. Velocity of sound. Mach number, flow regimes. Governing equations of inviscid compressible flow. Continuity, Momentum and Energy equations in Integral and Differential form. Stagnation conditions.

UNIT-II
FLOW THROUGH NOZZLES
Isentropic flow through Convergent – Divergent nozzles. Chocked flow conditions. Normal shock. Under and Over expansion conditions. Flow through diffusers – wave reflections from a free boundary. Description of supersonic wind tunnels and rocket engine.

UNIT-III
OBLIQUE SHOCKS AND EXPANSION WAVES
Oblique shock relations. Super sonic flow over a wedge, M relations strong and weak shock solutions / Shock polar. Regular reflection from a solid boundary. Intersections of shock wave. Expansion waves. Prandtl – Meyer Expansion.

UNIT-IV
SUBSONIC COMPRESSIBLE FLOW OVER AIRFOIL
Introduction - Velocity potential equation – Transonic small perturbation equation - Prandtl-Glauert compressibility corrections - Critical Mach number - Drag divergence Mach number - Area rule - Supercritical airfoil.

UNIT-V
SUPERSONIC FLOW
Linearized supersonic flow- Linearized supersonic flow over airfoil and wings. Shock Expansion theory. Detached shock. Axi-symmetrical flows-flow past slender bodies of revolution, conical flows-Numerical integration procedure.

UNIT-VI
HYPERSONIC FLOWS
Qualitative aspects of hypersonic flow. Newtonian theory. Flat plate at an angle of attack. Hypersonic shock wave relations. Lift and drag of wings at hypersonic speeds. Recent advances in hypersonic flows and testing techniques.

UNIT-VII
FLOW MEASUREMENTS AND MODEL TESTING
Non dimensional parameters andII numbers Similarity of flows. Model testing in wind tunnels. Pressure, Velocity measurements – Hotwire and Laser – Doppler anemometer, Turbulence measurements. Measurement errors. Test section speed, horizontal buoyancy, flow angularities.

UNIT-VIII
FORCE MEASUREMENTS WIND TUNNEL BALANCES
Force measurements – Wind tunnel balances. Scale effects and corrections, wall interferences, induced drag and other computations/corrections.

TEXTBOOKS
1. Fundamentals of Aerodynamics, Anderson, J .D., Mc Graw-Hill International 3/e, Singapore-2001.
2. Gas Dynamics, Radhakrishnan, E, E., Prentice Hall of India, 1995

RFFERENCES
1. Modern Compressible Fluid Flow, Anderson, J .D., Mc Graw-Hill International Edition
2. Compressible Fluid Dynamics with Computer Application, Hodge B.K & Koenig K Prentice Hall, 1995
3. Aerodynamics, Clancy, L.J., Pitman, 1986, Macmillan, 1985
4. Fundamentals of Aerodynamics : Bases of Aerodynamic design, Knethe, 5/e, Yes Dee Publications Wiley India

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(9A21504) AEROSPACE VEHICLE STRUCTURES – II

UNIT – I
LOAD DIFFISION IN STIFFNED PANELS
Wagner's theory of beams. Shear carrying capabilities of panels and introduction to Tension field webs. Semi tension and complete tension field beams. Monocoque and semi Monocoque structures.

UNIT – II
SHEET STRINGER COMBINATIONS
Axial Load flow diagrams for boom in stiffened panels. Simple illustrative examples of A/C sheet stringer elements through free body diagrams. Load diffusion in thin walled panels with oblique stiffeners.

UNIT – III
STABILITY OF PANELS
Stability of stiffened panels. Effective width concept. Simple estimations of load carrying capability of stressed skins of Aircraft wing shells.

UNIT – IV
SHEAR FLOW IN OPEN SECTIONS SUBJECTED TO PURE BENDINGS
Thin walled beams - Shear centre and Elastic axis Concept of shear flow beams with one axis of symmetry, Unsymmetrical box beam with effective and ineffective skins
.
UNIT - V
STRESS ANALYSIS OF WING AND FUSELAGE
Procedure - Shear and bending moment distribution for semi cantilever and other types of wings and fuselages - Thin webbed beam with parallel and non parallel flanges - Shear resistant web beams.

UNIT - VI
TORSION BENDING OF OPEND TUBES
Torsion bending phenomena. Torsion bending constant and specific torsion bending strength Simple derivation of torsion bending equation. The

phenomena of warping. Stresses in cantilever, I-beam by solution of general differential equation for torsion beam.

UNIT – VII
INHIBITION OF AXIL CONSTRAINT STRESS
Torsion of thin walled beams with open sections effect of axial constraints. Primary and Secondary warping phenomena. Computation of torsion bending constant for open tubes with cross sections such as Channel, T and Angle.

UNIT – VIII
AIRCRAFT SKIN STIFFNERS
Methods of improving torsion bending strength by lipping, as an effective means of improving torsion bending constant. Computation of improvement of specific torsion bending strength in lipped Channel, T, I, L, sections over the unlipped counter parts

TEXT BOOKS
1. Aircraft Structures for Engineering Students, Megson, T.M.G., Edward Arnold, 1985.
2. Mechanics of Elastic Structures, J.T. Oden, McGraw-Hill. 1967
3. Airplane Structural Analysis and Design, Scheler.E.E and Dunn L.G, John Wiley & Sons.1963

REFERENCES
1. Aircraft Structures, Peery, D.J, and Azar, J.J., 2 /e, Mc Graw-Hill, N.Y., 1993.
2. Theory and Analysis of Flight Structures, Rivello, R.M., McGraw Hill, 1993.
3. Analysis and Design of Flight Vehicles Structures, Bruhn. E.H, Tri - state off set company, USA, 1965.
4. Stresses in Aircraft and Shell Structure, Kuhn.P, McGraw-Hill.
5. An Introduction to the Theory of Aircraft Structures, William.D, Edward Arnold.

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(9A21505) AEROSPACE PROPULSION – I

UNIT -I
FUNDAMENTALS OF GAS TURBINE ENGINES
Illustration of working of gas turbine engine - The thrust equation - Factors affecting thrust – Effect of pressure, velocity and temperature changes of air entering compressors – Method of thrust augmentation – Characteristics of turboprop, turbojet – Performance characteristics.

UNIT - II
SUBSONIC INLETS
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 eternal deceleration ratio - Diffuser performance .

UNIT - III
SUPERSONIC INLETS
Supersonic inlets - Starting problem in supersonic inlets - Shock swallowing by area variation- External deceleration – Modes of inlet operation.

UNIT - IV
COMBUSTION CHAMBERS AND PERFORMANCE
Classification of combustion chambers – Important factors affecting combustion chamber design – Combustion process – Combustion chamber performance.

UNIT - V
PERFORMANCE SENSITIVITY
Effect of operating variables on performance - Flame tube cooling - Flame stabilization – Use of flame holders – Numerical problems.

UNIT - VI
NOZZLES
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 - VII
CENTRIFUGAL COMPRESSORS
Principle of operation of centrifugal compressors - Work done and pressure rise -
Velocity diagrams - Diffuser vane design considerations – Concept of Prewhirl –
Rotating stall.

UNIT - VIII
AXIAL FLOW COMPRESSORS
Elementary theory of axial flow compressor – Velocity triangles – Degree of reaction - Three dimensional flow - Air angle distribution for free vortex and constant reaction designs - Compressor blade design - Centrifugal and Axial compressor performance characteristics.

TEXT BOOKS
1. Gas Turbines and Jet & Rocket Propulsion, Mathur M L & Sharma R P; Standard Publisher, Delhi, 2000.
2. Gas Turbine Theory, Cohen, H. Rogers, G.F.C. and Saravanamuttoo,H.I.H., Longman, ELBSEd, 1989.

REFERENCES
1. AeroThermodyanamics of Aircraft Engine Components, Oates G C, AIAA Edn. Services, NY, 1986.
2. Jet Engine, . Rolls- Royce, 3rd edition, 1983.
3. Gas Turbines, Ganesan V, 3/e, Mc Graw Hill
4. Mechanics and Thermodynamics of Propulsion, Philipa Hill and Carl Peterson, Addison Wesley Longman Inc, 1999.

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(9A21506) MECHANISMS AND MECHANICAL DESIGN

UNIT - I
MECHANISMS
Elements of links – Classification – Rigid link, flexible and fluid link – Types of kinematic pairs – Sliding, turning, rolling, screw and spherical pairs – Lower ad higher pairs – Closed and open pairs – Constrained motion – Completely, partially or successfully constrained and incompletely constrained.

MACHINES
Mechanism and machines – Classification of machines – Kinematic chain – Inversion of mechanism – Inversion of quadratic cycle, Chain – single and double slider crank chains. Exact and approximate Straight line Mechanisms - Peaucellier, Hart T. Chebibheff , Pantograph.

UNIT – II
KINEMATICS
Velocity and acceleration – Motion of link in machine – Determination of velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain.

ANALYSIS OF MECHANISMS
Analysis of slider crank chain for displacement, Velocity and acceleration of sliding – Acceleration diagram for a given mechanism, Kleins construction, Coriolis acceleration, Determination of Coriolis component of acceleration.

UNIT – III
PLANE MOTION OF BODY
Instantaneous center of rotation, centroids and axodes – Relative motion between two bodies – Three centers in line theorem – Graphical determination of instantaneous center, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – IV
Precision: Effect of Precision on Stability of moving vehicles such as motorcar motorcycle Aero planes and ships. Static and Dynamic forces generated due to in Precission in moving mechanisms including Gyroscopic motions.

UNIT – V
CAMS
Definition of cam and followers – Their uses – Types of followers and cams – Terminology – Types of follower motion – Uniform velocity – Simple harmonic motion and uniform acceleration. Maximum velocity and Maximum acceleration during out ward and return strokes in all the above three cases.

UNIT – VI
ANALYSIS OF MOTION OF FOLLOWERS
Roller follower – Circular cam with straight, concave and convex flanks.

UNIT – VII
DESIGN OF MACHINE ELEMENTS
Principles of mechanical design- dimensional tolerances, fits. Design of common machine elements Springs, shafts, couplings, Universal coupling.

UNIT – VIII
GEARS AND GEAR TRAINS
Introduction to gears-types, Law of gearing, Tooth profiles, specifications, classification-Helical, Bevel and worm gears: Simple and reverted gear train, epicyclic gear trains-velocity ratio or train value

TEXT BOOKS
1. Theory of Machines, Dr Jagdish Lal, JM Shaw, 2003
2. Theory of Machines, PL Ballaney, Khanna Publishers, 2003.

REFERENCES
1. Theory of Mechanisms and machines, Amithab Ghosh and Asok Kumar Malik, East West Press Private Limited – 2001.
2. Theory of Machines, Abdulla Sharif, Dhanpat Rai, 1987.
3. Mechanism and Machine Theory, JS Rao and RV Dukkipati / New Age – 1996.
4. Theory of Machines Through Solved Problems, JS Rao / New Age – 1996.
5. Machine Design Pandya & Sha - Charotar Publication House – 1997.
6. Mechanical Engineering and Design, J.E.Shigley and Charles.R.Mischke, TMH, 2003.

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B.Tech. III -I Sem (Aero.E)   **T   P   C**
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(9A21507) AEROSPACE STRUCTURES LAB

1. Tensile testing using universal Testing Machine - Mechanical and optical Extensometers - Stress - strain curves and strength tests for various engineering materials.
2. Bending tests - Stress and deflection of beams for various end conditions - Verification of Maxwell's and Castiglianos theorems - Influence coefficients.
3. Compression tests on long and short columns - Critical buckling loads – South well plot.
4. Test on riveted and bolted joints.
5. Test using NDT inspection method.
6. Strain gauge techniques - Measurement of strain in beams, thin and thick walled cylinders subjected to internal pressure - Shaft subjected to combined loading.
7. Shear centre in open and closed sections beams - Test on semi-tension field beams.
8. Elastic constants for composite materials - Flexural test on composites.
9. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
10. Study and use of a Seismic pickup for the measurement of vibration amplitude.
11. Critical Fracture toughness of Aerospace material

Reference Books

1. Aircraft Structures for Engineering Students, Megson, T.M.G., Edward Arnold, 1985.
2. Analysis and Design of Flight Vehicles Structures, Bruhn. E.H, Tri -state off set company, USA, 1965

Equipment needed
1. UTM – 20 / 40 Tons with. Jigs and Fixtures and precision Extensometers

2. Deflection test rig (Fabricated hardware + precession dial gauge)
3. Shear center Test rig
4. NDT Equipment. a) Ultrasonic apparatus, b) Magnetic Particle test rig ,c) Dye penetration test.
5. Strain Measuring equipment a) wheat stone Bridge b) Multi channel strain measuring equipment   c) Various gauges / rosettes Various Hardware rigs desired in the lab for specific test.

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B.Tech. III -I Sem (Aero.E)   **T   P   C**
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(9A21508) PROPULSION LAB

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PROPULSION LAB
   1. Study of piston engine (Valve Timing And Port Timing Diagram)
   2. Stripping of a piston engine, visual inspection and reasoning for common troubles and trouble shooting
   3. Performance of piston engine
   4. Heat Balance Test on piston engine
   5. Engine Balancing
   6. Characterization of Aviation fuels

Equipment needed
   1. Low Speed Wind-tunnel Test Rig with a test section of 1 meter X 1 meter with necessary accessories.
   2. Test Rig for Axial flow Compressor
   3. Test rig for centrifugal flow compressor.
   4. Heat Engine Test Rig.
   5. Balancing test Rig
   6. Calorimeter apparatus
   7. Piston Engine

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B.Tech. III -II Sem (Aero.E)   **T   P   C**
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(9A21601) FLIGHT MECHANICS - II

UNIT – I

Degree of freedom of a system - Static and dynamic stability - Need for stability in an airplanes - Purpose of controls - Inherently and marginally stable airplanes.

UNIT – II
EQUATIONS OF MOTION

Equations of motion of a rigid body. Inertial forces and moments. Equations of motion of flight vehicles. Aerodynamic forces and moments. Decoupling of longitudinal and lateral-directional equations. Linearization of equations.

UNIT - III
AERODYNAMIC STABILITY DERIVATIVES

Aerodynamic stability and control derivatives. Relation to geometry, flight configuration. Effects of power, compressibility and flexibility.

UNIT – IV
STATIC LONGITUDINAL STABILITY AND CONTROL – CONTROL FIXED

Stick Fixed: Basic equilibrium equation - Stability criterion – Contribution of wing and tail and elevator to pitching moments - Effect of fuselage and nacelles - Effects of center of gravity location - Power effects - Stabilizer setting and center of gravity location – Elevator power– Elevator to trim . Trim gradients. Control fixed static stability – Control fixed neutral point. Stability margins.

UNIT – V
STATIC LONGITUDINAL STABILITY – CONTROL FREE

Effects of releasing the elevator. Hinge moment coefficients – Control forces to trim. Control free neutral point – Trim tabs. Aerodynamic balancing of control surfaces. Means of augmentation of control.

UNIT – VI
MANEUVER STABILITY

Contribution of pitch damping to pitching moment of flight vehicle - Effect on trim and stability. Control deflections and control forces for trim in symmetric maneuvers and coordinated turns. Control deflection and force gradients. Control fixed and control free maneuver stability. Maneuver points. Maneuver margins.

UNIT – VII
STATIC LATERAL AND DIRECTIONAL STABILITY AND CONTROL

Dihedral effect - Coupling between rolling and yawing moment - Adverse yaw - Aileron power - Aileron reversal. Weather cocking effects – Rudder power. Lateral and directional stability- definition. Control surface deflections in steady sideslips, rolls and turns one engine inoperative conditions - Rudder lock.

UNIT – VIII
DYNAMIC STABILITY AND RESPONSE TO CONTROL.

Solutions to the stability quartic of the linearised equations of motion. The principal modes. Phugoid , Short Period Dutch Roll and Spiral modes - Further approximations. Restricted degrees of motion. Solutions. Response to controls. Auto rotation and spin.

TEXT BOOKS
1. Aerodynamics for Engineering Students, Houghton, E.L., and Carruthers, N.B., Edward Arnold Publishers Ltd., London, 1989
2. Aerodynamics, Aeronautics & Flight Mechanics, Mc.Cormic, B.W., 2/e, Star Edu. John Wiley 1995

REFERENCES
1. Airplane Performance, Stability and Control, . Perkins C.D., & Hage, R.E., Wiley Toppan 1974.
2. Flight Stability and Automatic Control, Nelson, R.C., McGraw Hill 1989
3. Mechanics of flight, R.H. Bernard, A.C.Kermude and Dr. Philpott 11/e, Pearson, HL.

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(9A21602) AVIONICS

UNIT –I   BASICS
Basic principles of Avionics – Typical avionics sub system in civil/ military aircraft and space vehicles.

UNIT –II   FLIGHT DECK AND DISPLAY SYSTEMS
Flight deck display technologies – CRT, LED, LCD, Touch screen – Head up display – Electronic instrumentation systems.

UNIT-III   AUDIO AND COMMUNICATION SYSTEMS
Aircraft audio systems basic – audio transmitter and receiver principles – VHF communication system – UHF communication systems.

UNIT-IV   RANGING AND LANDING SYSTEMS
VHF Omni range – VOR receiver principles – distance maturity equipment – principles of operation – Instrument landing system – localizer and glide slope.

UNIT-V   POSITIONG SYSTEM
Global positioning system principles – triangulation – position accuracy – applications in aviation.

UNIT-VI   INERTIAL NAVIGATION SYSTEM
Principle of Operation of INS – navigation over Earth – components of inertial Navigation systems – accelerometers – gyros and stabilized platform.

UNIT-VII   SURVELLIENCE SYSTEM
ATC surveillance systems principles and operation interrogation and replay standards – Collision avoidance system – ground proximity warning system.

UNIT-VIII   AUTO FLIGHT SYSTEM
Automatic flight control systems – fly by wire and fly by light technologies – flight director systems – flight management systems. Integrated DATATRANSFER methodology by use of MILS – STD – 1553/ ARINC – 429.

TEXT BOOKS
1. Elements of electronic navigation, N.S.Nagaraja, Tata Mc Graw Hill, 1995.
2. Avionic systems Operation and maintenance, Janes W.Wasson, Jeppesen Sandersen Training products (Sterling Book House, Mumbai),1994.

REFERENCES
1. Principle of Avionics, Albert Hel frick, Avionics Communications Inc., 2000.
2. Aircraft Instrumentation and Integrated systems EHJ Pallet, Longman Scientific Technical (Sterling Book House, Mumbai) 1996.
3. Aircraft Radio Systems, J.Powell, Pitman publishers, 1998.
4. Avionics Narigation System, Kayton, 2/e, Yes Dee Publication, John Wiley.
5. Introduction to Avionics, Dale R. Cundy, Rick S. Brown, Pearson, H.L.

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(9A21603) AEROSPACE PROPULSION – II

UNIT - I
GAS TURBINE THEORIES
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.

UNIT – II
DESIGN CONSILRETIONS
Limiting factors in gas turbine design - Overall turbine performance - Methods of blade cooling - Matching of turbine and compressor - Numerical problems.

UNIT – III
THRUST CONTROL
Thrust Augmentation through after burning, thrust vector control methods.

UNIT – IV
RAMJET PROPULSION
Operating principle- Subcritical, 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 - V
FUNDAMENTALS OF ROCKET PROPULSION
Operating principle - Specific impulse of a rocket - Internal ballistics - Rocket nozzle classifications - Rocket performance considerations - Numerical problems.

UNIT - VI
CHEMICAL ROCKETS
Solid propellant rockets - Selection criteria of solid propellants - Important hardware components of solid rockets – Propellant grain design considerations.

UNIT - VII
Liquid propellant rockets - Cooling in liquid rockets - Limitations of hybrid rockets - Relative advantages of liquid rockets over solid rockets.

UNIT - VIII
ADVANCED PROPULSION TECHNIQUES
Electric rocket propulsion - Ion propulsion techniques - Nuclear rocket - Types - Solar sail- Preliminary concepts in nozzle less propulsion.

TEXT BOOKS
1. Rocket Propulsion Elements, Sutton, G.P., John Wiley & Sons Inc., New York, 5th Ed., 1993.
2. Mechanics and Thermodynamics of Propulsion, Philipa Hill and Carl Peterson, Addison Wesley Longman Inc, 1999.

REFERENCES
1. Aero Thermodyanamics of Aircraft Engine Components, Oates G C, AIAA Edn. Services, NY, 1986.
2. Rolls- Royce, Jet Engine, 3rd edition, 1983.
3. Gas turbine theory, Cohen. H., Rogers, G.F.C. and Saravanamuttoo, H.I.H., Longman Co., ELBS Ed., 1989.
4. Gas Turbines, Ganesan V, 3/e, Mc graw Hill.
5. Gas Turbines and Jet and Rocket Propulsion, Mathur, M., and Sharma, R.P.,Standard Publishers, New Delhi, 1988.
6. Fundamentals of Compressible Flow with Aircraft and Rocket propulsion, S M Yahya, New Age International Pub, Delhi, 2003.
7. Gas Turbines and space Propulasion, Rama Swamy, Jiaco

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B.Tech. III -II Sem (Aero.E)   **T   P   C**
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(9A21604) FLIGHT VEHICLE DESIGN

UNIT-I
OBJECTIVES AND REQUIREMENTS OF THE VEHICLE : Type, role, mission. Payload, performance and other requirements. Study of comparable aircraft - principal design and constructional and performance. Data collection and statistical analysis.

UNIT-II
CONCEPTUAL SKETCH AND FIRST ESTIMATE OF WEIGHT : Conceptual sketch of candidate design- alternative configurations. First estimate of take off weight.

UNIT-III
INITIAL SIZING : Airfoil and wing geometry selection. Estimates of thrust to weight ratio and wing loading.

UNIT-IV
FUSELAGE AND CONTROL SURFACES : Sizing of Fuselage and control surfaces.

UNIT-V
CONFIGURATION LAYOUT : Layout and drawing of the configuration. Weightbalance

UNIT-VI
PERFORMANCE AND STABILITY ESTIMATE : Performance and stability estimate.

UNIT-VII
LOAD ESTIMATES : Airload distribution on the wing. Preliminary structural Layout.

UNIT-VIII
REVIEW : Review and evaluation of the design.

TEXT BOOKS
1. Raymer, Daniel P. Aircraft Design: A Conceptual Approach (Third Edition) AIAA Educational Series. AIAA 1999

REFERENCE
1. Synthesis of Subsonic Airplane Design. Torenbeek E. Delft University Press 1986
2. Analysis and Design of Flight Vehicles Structures, Bruhn. E.H, Tri - state off set company, USA, 1965
3. Airplane Structural Analysis and Design, Scheler.E.E and Dunn L.G,John Wiley & Sons.1963
4. Introduction to Aerospace Structured Analysis, Allen, Yes Dee Publication John Wiley

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. III -II Sem (Aero.E)   **T   P   C**
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(9A21605) OPERATIONS MANAGEMENT

UNIT I: *INTRODUCTION TO MANAGEMENT***:** Concepts of Management and organization- Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

UNIT II: *DESIGNING ORGANISATIONAL STRUCTURES***:** Basic concepts related to Organisation - Departmentation and Decentralisation, Types of mechanistic and organic structures of organisation (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organisation, Cellular Organisation, team structure, boundaryless organization, inverted pyramid structure, lean and flat organization structure) and their merits, demerits and suitability.

UNIT III: *OPERATIONS MANAGEMENT***:** Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement-Statistical Quality Control: $\bar{X}$ chart, R chart, c chart, p chart, (simple Problems), Acceptance Sampling, Deming's contribution to quality.

UNIT IV:
A) MATERIALS MANAGEMENT: Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records - Supply Chain Management
 B) MARKETING: Functions of Marketing, Marketing Mix, Marketing Strategies   based on Product Life Cycle., Channels of distribution.

UNIT V: *HUMAN RESOURCES MANAGEMENT (HRM):* Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs. PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance

Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

UNIT VI: *PROJECT MANAGEMENT (PERT/CPM)***:** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)

UNIT VII: *STRATEGIC MANAGEMENT***:** Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives.

UNIT VIII: *CONTEMPORARY MANAGEMENT PRACTICES***:** Basic concepts of Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma and Capability Maturity Model (CMM) Levels, Value Chain Analysis,Enterprise Resource Planning (ERP), Performance Management, Business Process outsourcing (BPO), Business Process Re-engineering and Bench Marking, Balanced Score Card.

TEXT BOOK:
   1. Aryasri: *Management Science*, TMH, New Delhi.

REFERENCE:
   1. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2007
   2. Koontz & Weihrich: *Essentials of Management*, 6/e, TMH, 2007
   3. Thomas N.Duening & John M.Ivancevich *Management—Principles and Guidelines,* Biztantra,2007.
   4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2007.
   5. Memoria & S.V.Ganker, *Personnel Management*, Himalaya, 25/e, 2007
   6. Schermerhorn: *Management*, Wiley, 2007.
   7. Parnell: Strategic Management, Biztantra,20073.
   8. L.S.Srinath: PERT/CPM,Affiliated East-West Press, 2007.

Question Paper Pattern: 5 Questions to be answered out of 8 questions.
                    Each question should not have more than 3 bits.
                    Unit VIII will have only short questions, not essay *questions*.

Codes/Tables: Normal Distribution Function Table need to be permitted into the

        examination Hall.

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B.Tech. III -II Sem (Aero.E)   **T P C**
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(9A21606) INTRODUCTION TO SPACE TECHNOLOGY

UNIT-I
INTRODUCTION
Space Mission-Types-Space Environment-Launch Vehicle Selection

UNIT II
FUNDAMENTALS OF ROCKET PROPULSION
Introduction to rocket propulsion-fundamentals of solid propellant rockets-Fundamentals of liquid propellant rockets-Rocket equation

UNIT-III
ASCENT FLIGHT MECHANICS OF ROCKETS AND MISSILES
Two-dimensional trajectories of rockets and missiles-Multi-stage rockets-Vehicle sizing-Two stage Multi-stage Rockets-Trade-off Ratios-Single Stage to Orbit- Sounding Rocket-Aerospace Plane-Gravity Turn Trajectories-Impact point calculation-Injection conditions-Flight dispersions

UNIT-IV
ATMOSPHERIC REENTRY
Introduction-Steep Ballistic Reentry-Ballistic Orbital Reentry-Skip Reentry-"Double-
Dip" Reentry - Aero-braking - Lifting Body Reentry

UNIT-V
FUNDAMENTALS OF ORBITAL MECHANICS
Two-body motion-Circular, elliptic, hyperbolic, and parabolic orbits-Basic Orbital
Elements-Ground Trace

UNIT-VI
ORBITAL MANEUVERS
In-Plane Orbit changes-Hohmann Transfer-Bielliptical Transfer-Plane Changes- Combined Maneuvers-Propulsion for Maneuvers

UNIT -VII
SATELLITE ATTITUDE DYNAMICS
Torque free Axi-symmetric rigid body-Attitude Control for Spinning Spacecraft - Attitude Control for Non-spinning Spacecraft - The Yo-Yo Mechanism – Gravity – Gradient Satellite-Dual Spin Spacecraft-Attitude Determination

UNIT-VIII
SPACECRAFT POWER AND COMMUNICATION SYSTEMS
Spacecraft Power-Telecommunications

TEXT BOOKS
1. Spaceflight Dynamics, W.E. Wiesel, McGraw-Hill, 1997
2. Rocket Propulsion and Space flight dynamics, Cornelisse, Schoyer HFR, and Wakker KF, Pitman, 1984

REFERENCES
1. Understanding Space: An Introduction to Astronautics, J.Sellers, McGraw- Hill, 2000
2. Introduction to Space Flight, Francis J Hale, Prentice-Hall, 1994
3. Spacecraft Mission Design, Charles D.Brown, AIAA Education Series, 1998
4. Elements of Space Technology for Aerospace Engineers, Meyer Rudolph X, Academic Press, 1999

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

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B.Tech. III -II Sem (Aero.E)   **T   P   C**
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(9A21607) FLIGHT VEHICLE DESIGN LAB

1. Objectives Requirements of the vehicle
2. Conceptual Sketch and first estimate of weight
3. Initial Sizing
4. Fuselage and control surfaces
5. Configuration layout.
6. Performance and stability Estimate
7. Load estimates

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(9AHS601) ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB
(Common to ECE, E Con E, ECM, EIE, EEE, ME, AE)

1. Introduction

The Advanced English Language Skills Lab introduced at the 3rd year B.Tech level is considered essential for the student for focusing on his/her career. At this stage it is imperative for the student to start preparing for the ever growing competition in the job market. In this scenario, in order to be on par with the best, he/she needs to improve his/her Communication and soft skills

This course focuses on the practical aspects of English incorporating all the four (LRSW) skills relevant to the requirements of the prospective employers in view of globalization. The proposed course will enable the students to perform the following:

- Intensive reading to improve comprehension and communication
- Attentive listening for better understanding
- Write project/research/technical reports
- Write Resume' to attract attention
- Discuss ideas / opinions for better solutions
- Face interviews confidently
- Gather information, organize ideas, and present them effectively before an audience
- To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required ability to face computer-based competitive exams such GRE, TOEFL,CAT, GMAT etc.

2. Objectives:

Keeping in mind the previous exposure of the student to English, this lab focuses on improving the student's proficiency in English at all levels. The lab intends t**o** train students to use language effectively, to participate in group discussions, to help them face interviews, and sharpen public

speaking skills and enhance the confidence of the student by exposing him/her to various situations and contexts which he/she would face in his/her career

3. Syllabus
The following course content is prescribed for the Advanced Communication Skills Lab:

Reading Comprehension -- Reading for facts, guessing meanings from context, speed reading, scanning, skimming for building vocabulary(synonyms and antonyms, one word substitutes, prefixes and suffixes, idioms and phrases.)

Listening Comprehension-- Listening for understanding, so as to respond relevantly and appropriately to people of different backgrounds and dialects in various personal and professional situations.

Technical Report Writing—Types of formats and styles, subject matter, organization, clarity, coherence and style, data-collection, tools, analysis

 Resume' Writing—Structure, format and style, planning, defining the career objective, projecting one's strengths, and skills, creative self marketing, cover letter

 Group Discussion-- Communicating views and opinions, discussing, intervening. providing solutions on any given topic across a cross-section of individuals,(keeping an eye on modulation of voice, clarity, body language, relevance, fluency and coherence) in personal and professional lives.

 Interview Skills—Concept and process, pre-interview planning, mannerisms, body language, organizing, answering strategies, interview through tele and video-conferencing

 Technical Presentations (Oral)— Collection of data, planning, preparation, type, style and format ,use of props, attracting audience, voice modulation, clarity, body language, asking queries.

4. Minimum Requirements
The English Language Lab shall have two parts:
 The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a TV, A digital stereo-audio and video system, Camcorder etc

System Requirement (Hardware Component):
Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:
P-IV Processor, Speed-2.8 GHz, RAM_512 MB minimum, Hard Disk-80 GB, Headphones
   Prescribed Software: GLOBARENA

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. **Technical writing and professional communication, Huckin and Olsen** Tata Mc Graw-Hil 2009.
2. **Speaking about Science**, A Manual for Creating Clear Presentations **by Scott Morgan and Barrett Whitener, Cambridge University press, 2006**
3. **Books on** TOEFL/GRE/GMAT/CAT/ IELTS **by Barron's/DELTA/Cambridge   University Press.**
4. **Handbook for Technical Writing** by David A McMurrey & Joanne   Buckely CENGAGE Learning 2008
5. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
6. **The ACE of Soft Skills** by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010
7. **Cambridge English for Job-Hunting** by Colm Downes, Cambridge University Press, 2008
8. **Resume's and Interviews** by M.Ashraf Rizvi, Tata Mc Graw-Hill, 2008
9. **From Campus To Corporate** by KK Ramachandran and KK Karthick, Macmillan Publishers India Ltd, 2010
10. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
11. **Managing Soft Skills** by K R Lakshminarayan and T.Muruguvel, Sci-Tech Publications, 2010
12. **Business Communication** by John X Wang, CRC Press, Special Indian Edition,2008

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(9A21701) FINITE ELEMENT AND MODELLING METHODS

UNIT – I
MODELS

Macro and Micro mechanical models and 'Basis of The Finite Element-formulations for developing and specification structural models. Equilibrium and energy bases for designing such as stiffness, flexibility, Inertia, damping and stability characteristics. Degrees of freedom and their relevance's to approximate methods of analysis

UNIT – II
GENERELIZED COORDINATES

Introduction to generalized coordinates and their classification based frames of reference (local/global), nature and utility. Field specific nature of such coordinates in time & space for representing both continuua and discontinua. Non dimensional coordinates, Area and Volume coordinates, utility of generalized coordinates in respresenting continuum and discrete systems.

UNIT – III
DISCRETIZATION

Role of interpolation (Hermitian and Langragian) functions in discretization – concepts of nodes and elements in discretizing 1 – D and 2 – D Solid fluid continuua. Examples of discretization of heat conduction, shear, axial, Torsional and Bending deformations of constant and stepped – 1-D structures. Discretization of plane stress Plain strain and 3-D space frame problems

UNIT – IV
PROPERTIES AND DERIVATION

Derivation of element property matrices from first principles - energy basis for deriving stiffness, mass element properties – Assembly Technique - Concept of work done and derivation of kinematically consistent load vectors Direct deduction of matrix equation of equilibria using assembly technique for property derivation for 1-D structures and frames.

UNIT – V
APPROXIMATIONS AND ERROR CONTROL
Nodal parametric representation of discrete domains and fields. Isoparametric, Subparametric and Superparametric representation. Injection of singularity in field distortions and their utility in fracture mechanics.

UNIT – VI
MATHEMATICAL TOOLS AND FEM TOOLS
Importance of designing codes in discretizing. Illustration of 1-D and 2-D field problems. Basics of Numerical integration and Gauss quadrature. Techniques of data storage and solution of storage of large scale matrices. Concept of bandwidth and Front widths and their minimization. In core, and out of core solution of based on matrices. Frontal techniques.

UNIT – VII
CONCEPTS OF SYMMETRY
Symmetries in 1-D, 2-D Structures including Axisymmetry. Symmetry Operations and Symmetry boundary conditions for fractional models in Analysis

UNIT – VIII
MESH GENERATION TECHNIQUES,
 Using Commercial software's such as ANSYS, NISA, NASTRAN, ASKA, CAEFEM etc.

TEXT BOOKS
1. Concepts and Application of FEA, R.D.Cook, David S. MALKUS, Micheal E_PLESHA, Robert J. Witt Wiley Student Edition, India, 2002.
2. The Finite Element Methods in Engineering, S S. Rao, Pergamon.2004

REFERENCES
1. Applied Finite Element Analysis, Segarlind, L.J.,John Wiley and Sons, Inc., New York, 1991.
2. Finite Elements for Engineers, Kenneth H. Hubneer, Donald L. Dewhivst and others, John Wiely & Sons.
3. Finete Element methods, its basic and fundamentals, O C Zien Kienicz, Elsevier.
4. Introduction to Finite Elements in Engineering, Tirupathi R.Chandrupatla and Ashok D Belagundu, PHI 2006
5. Finite Element and Modelling Methods, KSRK Prasad.

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

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(9A21702) VIBRATIONS AND STRUCTURAL DYNAMICS

UNIT I
INTRODUCTION
Simple harmonic motion, terminology, Newton's Law, D'Alembert's Prinicple, Resonance, Introduction to mechanism of damping. Damped and Undamped oscillations. Degrees of freedom. Various mechanisms of damping. Equivalent viscous damping.

UNIT II
SINGLE DEGREE OF FREEDOM SYSTEMS
Free vibrations, free damped vibrations, forced vibrations with and without damping. Support excitation and vibration measuring instruments. Amplitude and Phase response diagrams. Generalized single degree of freedom systems for continuous structures and computation of K, M and C.

UNIT III
MULTI DEGREE OF FREEDOM SYSTEMS
Two / Three degree of freedom systems, static and dynamic coupling, vibration absorbers, Principal coordinates, Principal modes, Othogonality conditions Hamilton's Principle, Lagrange's equation and application. Longintudinal vibration, lateral vibration, torsional vibration of shafts, dynamical equations of equilibria of elastic bodies, natural frequencies and modeshapes determination.

UNIT IV
Methods determining natural frequencies and mode shape. Natural Vibrations of solid continua. Determination of Eigen Values and Eigen modes.

UNIT V
Natural frequency of rotating shafts Whirling of shafts. Dynamic balancing of rotating shafts. Dynamic dampers.

UNIT VI
Introduction to approximate methods for frequency analysis Rayleigh Ritz method for vibration analysis. Diagonalization of stiffness, mass and damping matrices using orthogonality conditions.

UNIT VII
Matrices for dynamic analysis. Kinematically consistent Load systems and determination of [K], [M], [C] and [L] matrices. Normalization and formulation of modal equations.

UNIT VIII
Steady state response, using fourier analysis for decomposing complex periodie load functions, of modal equations using S-plane representation. Transient response analysis of modal equations using Duhamel's integrals.

TEXT BOOKS:
1. Dynamics of Structures. R.W. Clough and Penzien, McGraw Hill 2/e,1993
2. Mechanical Vibrations, Singiresure.S.Rao, Pearson Education LPE-2004.
3. Theory and practice of Mechanical vibrations, Rao, J.S and Gupta .K., Wiley Eastern Ltd., New Delhi, 2002.

REFERENCES:
1. An Introduction to Theory of Aeroelasticity, Fug, Y.C., John Wiley & Sons, NewYork, 1984
2. Vibration Problems in Engineering, Timoshenko, S., John Wiley and Sons, New York, 1987.
3. Shock and Vibrations, Harris & Creed Mc-Graw Hill book company, third edition.
4. Mechanical Vibrations, V.P.Singh, Dhanapati Rai and Co. 2003 edition.
5. Mechanical Vibrations, S.Grahamkelly- TMH 2004 edition.
6. Mechanical Vibrations, G.K.Groover, Nemchand and Brothers 2001 edition.
7. Vibrations and waves ,CBS Publishers and Distributors MIT series 1987.
8. Introduction to the Study of Aircraft Vibration & Flutter, Scanlon, R.H., & Rosenbaum, R., John Wiley and Sons, New York, 1982

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(9A21703) COMPUTATIONAL AERODYNAMICS

UNIT-I
BASICS
Introduction to computational fluid dynamics – Research tool – Design Tool, Finite control volume, infinitesimal fluid element, substantial derivatives, divergence of Velocity.

UNIT-II
GOVERNING EQUATIONS OF FLUID DYNAMICS
The continuity equation, the momentum equation, the energy equation, physical boundary conditions.

UNIT-III
SHOCK FITTING AND SHOCK CAPTURING
Form of Governing equation suited for CFD - Conservation form - shock fitting and shock capturing.

UNIT-IV
IMPACT OF PARTIAL DIFFERENTIAL EQAUTIONS ON CFD
Introduction, Classification of Quasi-Linear Partial differential equation, The Eigen value method, General behavior of different classes of Partial differential equation – elliptic, parabolic and hyperbolic.

UNIT-V
DISCRETIZATION
Introduction, Finite differences, difference equations, Explicit and implicit approaches, Errors and an analysis of stability.

UNIT-VI
TRANSFORMATIONS
Introduction, transformation of the governing partial differential equations, Matrices and the Jacobian of transformation

UNIT-VII
GRID GENERATIONS – I
Grid Generation techniques, Elliptic Grid Generator – Simply connected domain –doubly connected domain.

UNIT-VIII
GRID GENERATIONS – II
Coordinate system control – Grid Point clustering, Introduction to Hyperbolic Grid Generation techniques and parabolic grid generator.

TEXT BOOKS
1. Computational Fluid Dynamics for Engineers, Hoffmann, K.A: Engineering Education System, Austin, Tex., 1989
2. Advanced Engineering Mathematics, Kreyszig,E., Wiley, New York

REFERENCES
1. Computational Fluid Dynamics, John .D. Anderson McGraw Hill
2. Computational Fluid Mechanics and Heat Transfer, Anderson, Dale A., John C. Tanhill and Richard H. Pletcher, McGraw Hill, New York 1984, Volumes I & II
3. Introduction to Computational Fluid Dynamics, Chow CY, John Wiley, 1979
4. Numerical heat transfer and fluid flow, Suhas V. Patankar, Butter – worth Publications.
5. Computation as Fluid Dynamics, Jiyuess and others, Elsevier, 2008.

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(9A21704) STRUCTURAL ANALYSIS AND DETAILED DESIGN

UNIT I
Design Philosophy of aircraft systems -Principles of design -Configuration design-Arriving design specification for detailed design

UNIT II
DESIGN METHODOLOGIES
Emphasis on design procedures for the design of wings, fuselage, landing gear, pressure vessels including manevouring loads.

UNIT III
ENGINEERING DESIGN
Design of Aircraft parts and landing gears using engineering design methods/codes and standards to arrive at design for detailed analysis.

UNIT IV
FUSELAGE DESIGN
Loads, effective cross-section, bending strength shearflow analysis. Ultimate strength of stiffend Cylindrical Shells.

UNIT V
MODELLING AND SIMULATION OF WING SURFACES
Estimation of wing loading, wing idelization, mesh generation, element formulation, consistent load vectors, solutions and stress distribution.

UNIT VI
ANALYSIS OF LANDING GEAR
Evaluation of reaction loads on the members of the landing gear and analysis of lauding gear system, oleo strut, torque links.

UNIT VII
RELIABILITY BASED DESIGN
Reliability concepts, bath tub curve, design improvements for reliability.

UNIT VIII
FAILURE THEORIES
Maximum stress theory, Von Mices theory, Minimum strain energy theory as applicable to aerospace structure and criteria for selection

TEXT BOOKS
1. Aircraft Structures, Peery, D.J, and Azar, J.J., 2nd edition, Mc Graw-Hill, N.Y., 1993.
2. Theory and Analysis of Flight Structures, Rivello, R.M., McGraw Hill, 1993.
3. Mechanics of Elastic Structures, J.T. Oden, McGraw-Hill. 1967
4. Airplane Structural Analysis and Design, Scheler.E.E and Dunn L.G, John Wiley & Sons.

REFERENCES
1. Aircraft Structures for Engineering Students, Megson, T.M.G., Edward Arnold, 1985.
2. Analysis and Design of Flight Vehicles Structures, Bruhn. E.H, tri - state off set company, USA, 1965.
3. Mechanics of Elastic Structures, J.T. Oden, McGrawHill.
4. Stressess in Aircraft and Shell Structure", Kuhn.P, McGrawHill
5. An Introduction to the Theory of Aircraft Structures, William.D, Edward Arnold.
6. The Airplane Structure, Kermode.A.C, Sir Issacc Pitman Publication.
7. Structural Principles and Data, Dowty G.H The new ERA Publishing Cp, 1980.
8. Mechanical Engineering Design. Shigley JE,
9. Machine Design, Pandya & Shah, Charotar Publication.

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(9A21705) EXPERIMENTAL STRESS ANALYSIS
(ELECTIVE – I)

UNIT – I
MEASUREMENTS
Basic principles, Accuracy, Sensitivity, Range Measurements, Errors.

UNIT – II
EXTENSOMETERS
Mechanical, Optical, Acoustical and Electrical extensometers and their use –
Advantage and disadvantage.

UNIT – III
STRAIN GAUGE - PRINCIPLES
Principles and operation of electrical strain gauge- Requirement - Type and
their uses, Material for strain gauge, Calibration, Cross sensitivity, Rosette
Analysis.

UNIT - IV
STRAIN GAUGE – STRAIN MEASUREMENT
Wheatstone bridge and potentiometer circuits for static and dynamic strain
measurements, Strain indicator.

UNIT – V
PHOTOELASTICITY
Two dimensional Photoelasticity, Concept of Light – Photo–elastic effects,
Stress and optic law.

UNIT – VI
FRINGE INTERPOLATION TECHNIQUS
Interpretation of fringe pattern, Compensation and separation techniques,
Photoelastic material.

UNIT – VII
NON-DESTRUCTIVE TESTING – I
Fundamentals of Non Destructive Testing, Radiography, Ultrasonic
Inspection,Ultrasonic C-Scan, Magnetic particles Inspection, Fluorescent
penetrant technique, Eddy current testing, Acoustic Emission Technique.

UNIT – VIII
NON-DESTRUCTIVE TESTING – II

Fundamentals of brittle coating methods, Intoduction to Moiré Techniques, Holography, Thermography.

TEXT BOOKS
1. Experimental Stress Analysis, Daily, J.W., and Riley, W.F., McGraw Hill Inc., New York 1978
2. Mechanical Measurement / Beckwith, Maragoni and Lienhard / Addision – Wesley

REFERENCES
1. Hand Book of Experimental Stress Analysis, Hetyenyi, M., John Wiley and Sons INC., New York, 1972
2. Experimental Stress Analysis, Srinath, L.S., Raghava, M.R., Lingaiah, K., Gargesha, G. Pant B., and Ramachandra, K., Tata McGraw Hill, New Delhi, 1984.
3. Acoustic Emission in Acoustics and Vibration Progress, Pollock A.A., Stephens R.W.B., Chapman and Hall, 1983.
4. Manufacturing Engineering Technology, Kalpakajam / Addision Wesley.

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(9A21706) ANALYSIS OF COMPOSITE STRUCTURES (ELECTIVE – I)

<u>Coursse Objective</u>:
This course mainly deals with imparting knowledge in the analysis of Multi-layered composite laminated plates using Micromechanics properties of composites materials, derivation of mechanical properties of laminates, generalized Hooke's Law & Stresses in Classical and laminated plates with symmetric, anti-symmetric and un-symmetric layered composites

UNIT-I
Introduction to laminated composite plates, Mechanical Properties of constituent materials such as Matrix and Filaments of different types.

UNIT-II
Netting analysis of composite materials, determination of properties of lamintes with fibers and matrices.

UNIT-III
Stress-Strain relations of Isotropic, Othotropic and Anisotropic materials, transformation of material properties for arbitrary orientation of fibres.

UNIT-IV
Methods of Analysis: Mechanics of materials approach to determine Young's modulus, Shear Modulus and Poisson's ratio, brief mention of elasticity approach and Macro mechanics of laminates

UNIT-V
Anisotropic elasticity, stress –strain relations in material coordinates - Transformation of geometric axes, strength concepts, Biaxial strength theories, Maximum stress and Maximum strain.

UNIT-VI
Analysis of laminated plates: Classical plate theory, Classical lamination theory – Special cases of single layer, symmetric, anti-symmetric &

unsymmetric composites with cross ply, angle ply lay up. Deflection analysis of laminated plates. Analysis laminated beam and plates.

UNIT-VII

Shear deformation theories for composite laminated beams, plates.

UNIT-VIII

Buckling analysis of laminated composite plates with different orientation of fibres.   Tsai-wu criteria and Tsai – Hill Criteria.

TEXT BOOKS
1. Mechanics of Composite Materials, Jones R.M., McGrawHill Kogakusha, Ltd. Tokyo.
2. Mechanics of Composite Meterials and Structures Mudhujith Mukhopadhyay, University Press

REFERENCES:
1. Analysis and performance of fibre composites, Agarwal B. D., Broutman. L. J., John Wiley and sons – New york, 1980.
2. Hand Book on Advanced Plastics and fibre glass, Lubin. G, Von. Nostrand, Reinhold Co. New york, 1989.
3. Advanced Composite Materials, Lalith Gupta, Himalayan book, New Delhi, 1998.
4. Composite Materials, Kishan K. Chawla, Springer Intrl.Edition.

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(9A21707) AIRPORT MANAGEMENT
(Elective-1)

UNIT-I
AIRPORTS AND AIRPORT SYSTEMS
Introduction-Airport Management on an international level- Rules that govern airport management-Airport ownership and organization-Airport organization chart-Airport manager and public relations

UNIT-II
THE AIRFIELD
Components of an airport-The airfield-Navigation aids(NAVAIDS)located on airfields-Air traffic Control and surveillance facilities located on the airfield-Weather reporting facilities located on airfields-security infrastructure on airfields

UNIT-III
AIRSPACE AND AIR TRAFFIC CONTROL
Air traffic control management and operating infrastructure-Basics of air traffic control-Current and future enhancements to air traffic control

UNIT-IV
AIRPORT TERMINALS AND GROUND ACCESS
Historical development of airport terminals-Components of airport terminal-Airport ground access

UNIT-V
AIRPORT OPERATIONS MANAGEMENT
Pavement management-Aircraft rescue and fire fighting(ARFF)=Snow and ice control-Safety inspection programs-Bird and wildlife hazard management

UNIT-VI
AIRPORT SECURITY
Transportation Security Administration-Security at commercial service airports-Security at general aviation airports

UNIT-VII
AIRPORT FINANCIAL MANAGEMENT
Airport financial accounting-Revenue strategies at commercial airports-Pricing of airport facilities and services-Variation in the sources of operating revenues-Rise in airport financial burdens-Airport funding-Airport financing-Private investment-Sale of the airport

UNIT-VIII
AIRPORT CAPACITY AND DELAY
Defining capacity-Factors affecting capacity and delay-estimating capacity-Simulation Models-Defining delay-Estimating delay-Analytical estimates of delay: queuing diagram-Approaches to reducing delay-administrative and demand management

TEXT BOOK

1. Airport Planning and Management, Alexander T. Wells and Seth B. Young, 5/e, McGraw-Hill,2004

REFERENCES
1. Airport Operations, Norman Ashford and H. P. Martin Stanton, Mc-Graw-Hill, 1999
2. Managing Airports: An International Perspective, Anne Graham, Butterworth-Heinemann, 2003
3. The Airport Business, Rigas Doganis, Routledge, 1992
4. Airport Systems: Planning, Design and Management, Richard D Neufville, McGraw-Hill, 2002

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

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B.Tech. IV -I Sem (Aero.E)   **T   P   C**
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(9A21708) AIRLINE MANAGEMENT
(ELECTIVE – II)

UNIT-I
AIRLINE INDUSTRY
Structure of Airline Industry (Domestic & International)-Growth and Regulation-Deregulation-Major and National Carriers-Regional Carriers-Economic characteristics of the Airlines

UNIT-II
AIRLINE MANAGEMENT AND ORGANIZATION
Levels of Management-Decision Making-Functions of Management-Staff Departments-Line Departments

UNIT-III
INTRODUCTION TO AIRLINE PLANNING
Airline Planning Process-Airline Terminology and Measures: airline demand, airline supply, average load factor, unit revenue, Airline Planning Decisions: Fleet Planning, Route Evaluation, Schedule Development, Pricing, Revenue Management

UNIT-IV
FLEET PLANNING AND ROUTE EVALUATION
Factors in Fleet Planning-Hub-and-Spoke System-Technical Aspects-Fleet Rationalization-Fleet Commonality-Long Range Aircraft-Noise Restrictions-Factors in Design and Development-Fleet Planning Process; Route Evaluation in Hub Networks-Route profitability estimation issues-Demand Driven Dispatch

UNIT-V
AIRLINE SCHEDULING
The Mission of Scheduling-Equipment Maintenance-Flight Operations and Crew Scheduling—Ground Operations and Facility Limitations-Schedule Planning and Coordination-Equipment Assignment and Types of Schedules-Hub-and-Spoke Scheduling-Data Limitations in Airline Scheduling

UNIT-VI
AIRLINE PRICING, DEMAND AND OUTPUT
Airline pricing and demand-Determinants of demand-changes in demand-Elasticity of demand-determinants of elasticity; Types of passenger fares-Pricing process-Airline costs-Pricing and output determination

UNIT-VII
AIR CARGO
Introduction-Market for Airfreight-Types of Airfreight rates: General Commodity rates, Specific commodity rates, Exception rates, joint rates, Priority reserves air freight, speed package service, container rates-Specific Air freight services: assembly service, distribution service, pickup and delivery service-Factors affecting air freight rates:costs of service, volume of traffic, directionality, characteristics of traffic, value of service, competition

UNIT-VIII
REVENUE MANAGEMENT
Revenue Management Objectives-Airline revenue maximization-Differential Pricing –Yield Management-Revenue Management Techniques-Flight Overbooking-Flight Leg Revenue Management-Origin-Destination Control

TEXT BOOKS
1. Air Transportation:A Management Perspective, Alexander T.Wells and John G.Wensveen, 5/e, Brooks Cole,2003

REFERENCES
1. Airline Management, Charles Banfe, Prentice-Hall, 1991,
2. The Airline business, . Rigas Doganis, Routledge, 2005
3. Wheels Up:Airlines Business Plan Development, John Wensveen, Brooks Cole,2003
4. Straight and Level:Practical Airline Economics, Stephen Holloway, Ashgate Publishing, 2003
5. Airline Marketing and Management, Stephen Shaw, Ashgate Publishing, 2004
6. An Introduction to Airline Economics , William O' Connor, 6/e, Praeger Publishers,2000
7. Airline Management, Peter P Belobaba MIT Open Courseware Lecture Notes, 2006

8. Airline Operations and Scheduling, Massoud Bazargan, Ashgate Publishing, 2004

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B.Tech. IV -I Sem (Aero.E)　　　　　　　**T　P　C**
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(9A21709) ROCKETS AND MISSILES
(ELECTIVE – II)

UNIT-I　SOLID PROPELLANT ROCKET SYSTEMS
Ignition system in rockets-Types of igniters-Igniter design considerations-Combustion system of solid rockets

UNIT-II　LIQUID PROPELLANT ROCKET SYSTEMS
Design consideration of liquid rocket combustion chamber, injector, propellant feed lines, valves, propellant tank outlet and helium pressurized and turbine feed systems- Propellant slosh - Propellant hammer- Geysering effect in cryogenic rocket engines

UNIT-III　AERODYNAMICS OF ROCKETS AND MISSILES
Airframe components of rockets and missiles- Forces acting on a missile while passing through atmosphere- Classification of missiles- Method 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 up wash and downwash in missiles-Rocket dispersion.

UNIT-IV　TWO-DIMENSIONAL ROCKET MOTION IN VACUUM
Equations of motion-Rocket Motion in free space (Tsiokovsky's equation, Rocket Parameters, Burnout range)-Rocket Motion in a homogeneous gravitational field(Vertical flight, Constant Pitch angle, Gravity turns)

UNIT-V　MULTI-STAGE ROCKET
Nomenclature of the multi-stage rocket-Ideal Velocity of the multi-stage rocket-Vertical ascent in a homogeneous gravitational field and in vacuum (Burnout velocity- Culmination altitude-Vertical ascent of a two-stage rocket)

UNIT-VI　ALTITUDE CONTROL OF ROCKETS AND MISSILES
Rocket thrust vector control - Methods of thrust vector control-Thrust magnitude control, Thrust Termination

UNIT-VII　SEPARATION SYSTEMS FOR ROCKETS AND MISSILES
Stage separation dynamics-Separation techniques

UNIT-VIII   MATERIALS FOR ROCKETS AND MISSILES

Criteria for Selection of materials for rockets and missiles-Choice of materials at cryogenic temperatures, extremely high temperatures - Requirement of materials for thermal protection and pressure vessels

TEXT BOOKS
1. Rocket Propulsion Elements, George P. Sutton and Oscar Biblarz, Wiley- Interscience, 2000
2. Rocket Propulsion and Spaceflight Dynamics, J.W. Cornelisse, H.F.R.Schoyer, and K.F.Wakker, Pitman, 1979

REFERENCES
1. Missile Configuration Design, SS Chin, McGraw Hill, NY, 1961
2. Space Vehicle Dynamics, K.J.Ball and G.F.Osborne, Oxford University Press, 1967
3. Materials for Missiles and Spacecraft, E.R. Parker, McGraw Hill, 1982.

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(9A21710) PROPELLANT TECHNOLOGY
(ELECTIVE – II)

UNIT – I   LIQUID FUELS
Properties and tests for petroleum products - Motor gasoline - Aviation gasoline - Aviation turbine fuels - Requirements of aviation fuels of kerosene type and high flash point type - Requirements for fuel oils.

UNIT – II   SOLID PROPELLANTS – I
Single base propellants - Double base propellants - Composite propellants – CMBD propellants - Metallized composite propellants.

UNIT – III   SOLID PROPELLANTS – II
Introduction to different fuels and oxidizers of composite propellants – Brief introduction to composite theory of composite and double base propellants.

UNIT – IV   LIQUID PROPELLANTS – I
Various liquid propellants and their properties - Monopropellants and bipropellant system - concept of ullage - Ignition studies of liquid propellants.

UNIT – V   LIQUID PROPELLANTS – II
Propellant loading tolerances - inventory - Volume versus mass loading - Loading

measurement and control - Outage control.

UNIT –VI   CRYOGENIC PROPELLANTS – I
Introduction to cryogenic propellants - Liquid hydrogen, liquid oxygen, liquid nitrogen and liquid nitrogen and liquid helium and their properties.

UNIT –VII   CRYOGENIC PROPELLANTS – II
Theory behind the production of low temperature - Expansion engine – Cascade process - Joule Thompson effect - Magnetic effect - Ortho and para H2 - Helium 4 and Helium 3 - Ideal cycles and efficiency of cryo systems - Storing of cryogenic propellants - Cryogenic loading problems.

UNIT – VIII   PROPELLANT TESTING

Laboratory testing - Arc Image Furnace - Ignitability studies - Differential Thermal Analysis - Thermo-gravimetric analysis - Particle size measurement Micro-merograph - Strand burner tests impulse bomb - Performance estimation.

TEXT BOOKS
1. Rocket Propulsion and Space Dynamics, Cornelissse, J.W., J.W. Freeman & Co., Ltd., London, 1980.
2. Propellant Chemistry, Panrner, S.F. Reinhold Publishing Corp., N.Y 1985.

REFERENCES
1. Rocket Propulsion Elements, Shutton, G.P., John Wiley, 1993.
2. Fuels and Combustion, Sharma, S.P. and Mohan .C., Tata McGraw Hill Publishing Co, Ltd., 1984
3. Gas Turbine and Jet and Rocket Propulsion, Mathur, M., and Sharma, R.P., Standard Publishers, New   Delhi, 1988.

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B.Tech. IV -I Sem (Aero.E)   **T   P   C**
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(9A21711) COMPUTATIONAL STRUCTURAL AND AERODYNAMIC ANALYSIS LAB

A. FINITE ELEMENTS METHOD LAB
UNIT-I
One of the following
> a) Exercises on discretization
> b) Grid generation and element/node numbering

UNIT-II
Element Generation Exercises (two of the following) 1-D elements(rods, shafts and beams)
Plane Stress /Plane Strain Quadrilateral elements Triangular plate elements

UNIT-III
FEM Solutions using any one of the following
MATLAB
ANSYS
NASTRAN
PRO - E
Any one of the normal procedures:
> a) Gauss Quadrature for unit 1 and 2-D domes
> b) Generation of stiffness and load vector matrices.
> c) Use of eigen value solvers for frequency and mode shapes
determination

B. CFD LAB
UNIT – I
Numerical solutions for any one of the following, using Finite difference method.
Elliptic Equations
Parabolic Equations
Hyperbolic Equations

UNIT – II
Grid Generations for any one of the following

Algebraically stretched Cartesian grids.
Elliptic grids

UNIT – III
Numerical solutions for any one of the following
Vortex panel method
Source panel method
Incompressible coutte flow
Supersonic flow over a flat plate
Grid Generation of Aerofoil NACA 0012

Equipment Needed

1. Computers P-IV with 512 MB RAM and parallel processing computational facility 60 Nos / 60 students a batch.
2. 60 educational version licenses of a) MAT lab b) ANSYS c) NASTRAN
   d) Pro /e   e) FLUENT OR STAR CD or CFX

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(9A21712) STRUCTURAL ANALYSIS AND DETAILED DESIGN LAB

Design and Analysis of the following Aircraft Components:-
1. Landing Gear
2. Wings
3. Fuselage
4. Propeller Shaft
5. Propeller Blades
6. Nose Cone

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(9A21801) AIRCRAFT INSTRUMENTATION AND CONTROL SYSTEMS

UNIT – I
FLIGHT CONTROL SYSTEMS
Principles of flight control, flight control surfaces, control surface actuation, flight control linkage systems, trim and feel. Power control, mechanical, direct drive, electromechanical, electro-hydrostatic actuation ,multiple redundancy. The fly by wire system. Airbus and Boeing implementations. Inter-relationship of flight control, guidance and vehicle management systems.

UNIT – II
ENGINE CONTROL SYSTEMS
The engine control problem, fuel flow control, air flow control, control system parameters, example systems, design criteria. Engine starting, fuel control, ignition control, engine rotation, throttle levers, engine indications. Engine control on a modern civil aircraft. Integrated flight and propulsion control.

UNIT – III
FUEL SYSTEMS
Characteristics of aircraft fuel systems, fuel system components, fuel transfer pumps, fuel booster pumps, fuel transfer valves, non return valves. Fuel quantity measurement systems, level sensors, fuel gauging probes. Fuel system operation, fuel pressurisation, engine feed, fuel transfer, use of fuel as heat sink, external fuel tanks, fuel jettison, in-flight refuelling. Integrated civil aircraft fuel systems.

UNIT – IV
HYDRAULIC SYSTEMS
Importance of hydraulic systems, functions to be performed, the hydraulic circuit, actuation, the hydraulic fluid, hydraulic piping, hydraulic pump, fluid conditioning, the reservoir, emergency power sources. Aircraft applications, examples of B Ae, Airbus, Boeing implementations. The landing gear system for retraction, steering, braking and anti-skid.

UNIT – V
ELECTRICAL SYSTEMS

Aircraft electrical system characteristics, power (AC and DC) generation. Power generation control, voltage regulation, parallel operation, supervisory and protection functions. Modern electrical power generation types, constant frequency, variable frequency, variable speed constant frequency types. Primary power distribution, power conversion and energy storage. Secondary power distribution, power switching, load protection. Electrical loads, motors and actuators, lighting, heating, subsystem controllers, ground power. Emergency power generation. Electrical load management system.

UNIT – VI
PNEUMATIC SYSTEMS AND ENVIRONMENTAL CONTROL SYSTEMS.

Use of pneumatic power in aircraft. Sources of pneumatic power, the engine bleed air, engine bleed air control. Users of pneumatic power, wing and engine anti-ice, engine start, thrust reversers, hydraulic system, pitot static systems. Elementary treatment of :The need for controlled environment in aircraft. Sources of heat. Environmental control system design, ram air cooling, fuel cooling, engine bleed, bleed flow and temperature control. Boot strap Refrigeration system,Humidity control, Cabin pressurisation, tolerance, rain dispersal, anti-misting and demisting.

UNIT VII
AIRCRAFT INSTRUMENTATION - SENSORS AND DISPLAYS

Air data sensors, magnetic sensing, inertial sensing, radar sensors. The electromechanical instrumented flight deck, early flight deck instruments, attitude direction indicator, horizontal situation indicator, altimeter, airspeed indicator. Advanced flight deck display system architectures, display systems, display media, future flight deck displays.

UNIT VIII
SYSTEMS DESIGN AND DEVELOPMENT

System design, specifications and requirement, regulations, guidelines and certification. Safety processes, functional hazard analysis, preliminary systems safety analysis, system safety analysis, common cause analysis. Requirements capture, top-down approach and bottoms-up approach. Fault tree analysis, failure mode and effects analysis, component reliability, dispatch reliability,

Markov analysis. Development processes, software and hardware. Product life cycle phases - concept, definition, design, build, test, operate and disposal or refurbish. Major review processes. Software development process, verification and integration with hardware.

TEXT BOOKS
1. Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration, Moir, I. and Seabridge, A., AIAA (American Institute of Aeronautics & Astronautics) 2001
2. Civil Avionics Systems, , Moir, I. and Seabridge, A., AIAA (American Institute of Aeronautics & Astronautics) 2002

REFERENCES
1. Ground Studies for Pilots: Flight Instruments and Automatic Flight Control Systems, Harris, D., Blackwell Science, ISBN 0-632-05951-6 sixth edition 2004.
2. Aircroft Instruments, E.H.J.Pallet, Pearson, H.L.

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B.Tech. IV -II Sem (Aero.E)   **T   P   C**
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(9A21802) AEROSCAPCE TRANSPORATION SYSTEMS

UNIT –I
TRANSPORTATION SYSTEMS
Transportation as a human activity – significance – principal modes – applications. History of the development of transportation systems including aviation and space flight – some landmarks .

UNIT – II
AVIATION
The Atmospheric Flight – Science and Technology
The atmosphere – properties, Principles of atmospheric flight – aerostatic and aerodynamic forces. Generation of lift and thrust and reduction of drag-aerodynamic efficiency – the streamlined body.

UNIT-III
THE FLIGHT VEHICLE
Flight vehicle configurations. The Airplane-construction. Description of principal components – functions.

UNIT –IV
PERFORMANCE OF FLIGHT VEHICLES
Performance, stability and control of flight vehicles-relation to design features and construction. Structural loads on Airframe-requirements-principal structural design features.

UNIT-V
AIR SAFETY AND SECURITY
Purpose, role and mission of Civil and Military flight vehicles. Flight planning navigation, air traffic management, maintenance, ground support, airport and passenger facilitation systems – principal features.

UNIT – VI
AIR SAFETY AND SECURITY
Air safety- airworthiness of aircraft equipment – safety of operations. Civil
and Military Aviation regulatory agencies – role in prescribing and maintaining
air safety standards.

UNIT-VII
SPACE TRANSPORATION
The high altitude and space environment. Space vehicles-rockets, missiles,
earth satellites, space probes, and space stations-applications.

UNIT-VIII- AVIONICS
The role of avionics in the navigation, guidance and control of flight vehicles

TEXT BOOKS
1. Introduction to flight, Anderson J.D., McGraw Hill, 1995.
2. Flight without Formulae, Kermode, A.C., McGraw Hill 1987.

REFERENCE
1. Flight Theory and Aerodynamics: A Practical Guide for operational
   Safety, Dole, 2/e, Wiley India, Yes Dee Publications.

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B.Tech. IV -II Sem (Aero.E)　　　　　　　**T　P　C**
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(9A21803) SYSTEM MODELING AND SIMULATION
(ELECTIVE – III)

UNIT I
BASIC CONCEPTS
Hierarchy Types – Elements of a system – system description – Modeling definition – Functions, classification.

UNIT II
SIMULATION
Structure of Simulation Models – Modeling approaches – System simulation – Definition – The Simulation process – Advantages

UNIT III
TECHNIQUES FOR RANDOM NUMBER GENERATION
Simulation of random phenomena – Monte-Carlo sampling – Random number generation – Mid square method – Mid product method – Multiplicative congruential method – Additive congruential method,

UNIT IV
RANDOMNESS TESTING
Testing for randomness – Chi-square method – Kolmogrov method – Runs test – Gasp test.

UNIT V
DATA PREPARATION
Correlation and regression analysis – Curve fitting – Fitting of known distributions – Uniform, normal, exponential Poisson, Weibull empirical distribution – Time flow mechanism – Flow diagram

UNIT VI
SIMULATION OF DISCRETE SYSTEM – I
Simulation of an event occurrence using random number table – Simulation of component failure using exponential and Weibull models Simulation of single server and two server queue – Simulation of an inventory system.

UNIT VII
SIMULATION OF DISCRETE SYSTEM – II
Planning of simulation experiments – Tactical planning – Run length determination – Validation of simulation models – Analysis of simulation results

UNIT VIII
SIMULATION LANGUAGES
Introduction – Basic Concepts and Advantages of GPSS – Case Example – Basic concepts and advantages of SIMSCRIPT – Case example.

TEXT BOOKS
1. System Simulation with Digital Computers, Narasingh Deo, PHI, 1979.
2. System Simulation, Geoffrey Gordon, PHI, 1995.

REFERENCES
1. Discrete Event System Simulation, Jerry Banks, John S. Carson and Baryl nelson., PHI, 1996.

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(9A21804) HELICOPTER ENGINEERING
(Elective-III)

UNIT - I
ELEMENTS OF HELICOPTER AERODYNAMICS
Configurations based on torque reaction - Jet rotors and compound helicopters.

UNIT – II
ROTOR CONTROL
Methods of control - Collective and cyclic pitch changes - Lead-lag and flapping hinges.

UNIT - III
IDEAL ROTAR THEORY
Hovering performances - Momentum and simple blade element theories.

UNIT – IV
ROTOR PERFORMANCE
Figures of merit - Profile and induced power estimation - Constant chord and ideal twist rotors.

UNIT - V
POWER ESTIMATES
Induced, Profile and Parasite power requirements in forward flight - Performances curves with effects of altitude.

UNIT – VI
STABILITY AND TRIM
Preliminary ideas on helicopter stability.

UNIT - VII
LIFT AND CONTROL OF V/STOL AIRCRAFT
Various configuration - Propeller, Rotor ducted fan and jet lift - Tilt wing and vectored thrust - Performances of VTOL and STOL aircraft in hover, Transition and Forward motion.

UNIT - VIII
GROUND EFFECT MACHINES

Types - Hover height, Lift augmentation and power calculations for plenum chamber and peripheral jet machines - Drag of hovercraft on land and water. Applications of hovercraft.

TEXT BOOKS
1. Helicopter Theory, Johnson, W., Princeton University Pres, 1980.
2. Aerodynamics, Aeronautics & Flight Mechanics, McCormick, B.W., 2/e John Wiley, Star Edu. Books

REFERENCES
1. Aerodynamics of Helicopter, Gessow, A., and Myers, G.C., Macmillan & Co., N.Y.1987.
2. Aerodynamics of V/STOL Flight, . McCormick, B.W., Academics Press, 1987
3. Helicopter Engineering, Gupta, L Himalayan books, 1996.

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(9A21805) SPACE MECHANICS
(ELECTIVE-III)

UNIT-I
BASIC CONCEPTS
The solar system-Reference 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
The many body problem-Lagrange-Jacobi identity-The circular restricted three- body problem-Libration points-Relative Motion in the N-body problem

UNIT-III
THE TWO-BODY PROBLEM
Equations of motion-General characteristics of motion for different orbits-Relations between position and time for different orbits-Expansions in elliptic motion-Orbital Elements-Relation between orbital elements and position and velocity

UNIT-IV
THE LAUNCHING OF A SATELLITE
Launch vehicle ascent trajectories-General aspects of satellite injection-Dependence of orbital parameters on in-plane injection parameters-Launch vehicle performances- Orbit deviations due to injection errors

UNIT-V
PERTURBED SATELLITE ORBITS
Special and general perturbations- Cowell's Method-Encke's method-Method of variations of orbital elements-General perturbations approach

UNIT-VI
INTERPLANETARY TRAJECTORIES
Two-dimensional interplanetary trajectories-Fast interplanetary trajectories-Threedimensional interplanetary trajectories-Launch of interplanetary spacecraft-Trajectory about the target planet

UNIT-VII
BALLISTIC MISSILE TRAJECTORIES
The boost phase-The ballistic phase-Trajectory geometry-Optimal flights-Time of flight-Re-entry phase-The position of the impact point-Influence coefficients.

UNIT-VIII
LOW-THRUST TRAJECTORIES
Equations of Motion-Constant radial thrust acceleration-Constant tangential thrust(Characteristics of the motion, Linearization of the equations of motion-Performance analysis

TEXT BOOKS
1. Rocket Propulsion and Spaceflight Dynamics, J.W.Cornelisse, H.F.R. Schoyer, and K.F. Wakker, Pitman, 1979
2. Spaceflight Dynamics, William E.Wiesel, McGraw-Hill, 1997

REFERENCES
1. Spacecraft Mission Design, Charles D.Brown, AIAA Education Series, Published by AIAA, 1998
2. Orbital Mechanics, Vladimir A. Chobotov, AIAA Education Series, AIAA Education Series, Published by AIAA, 2002
3. Fundamentals of Astrodynamics and Applications, David.A. Vellado, Microcosm and Kluwer, 2001

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(9A21806) AIRCRAFT MAINTENANCE MANAGEMENT
(ELECTIVE-IV)

UNIT-I
NECESSITY OF MAINTENANCE

Role of engineer-Role of mechanic-types of maintenance-reliability-redesign-failure rate patterns-establishing a maintenance program

UNIT-II
DEVELOPMENT OF MAINTENANCE PROGRAMS

Maintenance steering group approach-process oriented maintenance-task oriented maintenance-maintenance program documents-maintenance intervals-changing basic intervals-Goals and objectives of in maintenance-maintenance program content

UNIT-III
CERTIFICATION REQUIREMENTS & DOCUMENTATION FOR MAINTENANCE

Aircraft certification-delivery inspection-operator certification-certification of personnel-aviation industry interaction; Manufacture's documentation-Regulatory documentation-Airline generated documentation

UNIT-IV
MAINTENANCE AND ENGINEERING ORGANIZATION

M&E organizational chart-manager level functions-organizational structure-variation of the typical organization

UNIT-V
PRODUCTION PLANNING AND CONTROL

Forecasting-production planning-production control-feedback for planning

UNIT-VI
LINE MAINTENANCE, HANGAR MAINTENANCE & MAINTENANCE OVERHAUL SHOPS

Makeup of line maintenance-maintenance center responsibilities-line operations-aircraft logbooks-ramp and terminal operations-line station activities; Organization of hangar maintenance-problem areas of hangar

maintenance-maintenance support shops-ground support equipment-a typical C check; Organization of overhaul shops-operation of overhaul shops-shop data collection

UNIT-VII
QUALITY CONTROL & QUALITY ASSURANCE
Quality control organization-basic inspection policies-requirement for quality assurance-quality audits-ISO 9000 standards-technical records

UNIT- VIII
RELIABILITY, MAINTENANCE SAFETY &TROUBLE SHOOTING
Types of reliability- typical reliability program-administration of reliability program; Industrial safety-safety regulations-maintenance safety program-accident and injury reporting; 3 levels of trouble shooting-knowledge of malfunctions-building a knowledge base-understanding the sequence of events-8 concepts of trouble shooting

TEXT BOOK
1. Aviation Maintenance Management, Harry A Kinnison, and Harry Kinnison, McGraw-Hill, 2004

REFERENCES
1. Aircraft Maintenance management, C.H.Friend, Longman, 1992

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(9A03505) HEAT TRANSFER
(ELECTIVE-IV)

UNIT – I
INTRODUCTION:
Modes and mechanisms of heat transfer – Basic laws of heat transfer –General applications of heat transfer.

Conduction Heat Transfer: Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.

UNIT – II
Simplification and forms of the field equation – steady, unsteady and periodic heat transfer – boundary and Initial conditions.

One Dimensional Steady State Heat Conduction:
in Homogeneous slabs, hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – Critical radius/thickness of insulation-with Variable Thermal conductivity –with internal heat sources or Heat generation. Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to errors in Temperature measurement.

UNIT III
ONE DIMENSIONAL TRANSIENT HEAT CONDUCTION:
In Systems with negligible internal resistance – Significance of Biot and Fourier Numbers - Chart solutions of transient conduction systems- Problems on semi-infinite body.

UNIT – IV
CONVECTIVE HEAT TRANSFER:
Dimensional analysis–Buckingham π Theorem and its application for developing semi – empirical non- dimensional correlations for convective heat transfer – Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy Equations.

UNIT – V
FORCED CONVECTION: EXTERNAL FLOWS:

Concepts of hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer for flow over-Flat plates, Cylinders and spheres..

Internal Flows: Division of internal flow through Concepts of Hydrodynamic and Thermal Entry Lengths – Use of empirical relations for convective heat transfer in Horizontal Pipe Flow, annular flow.

Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate – Use of empirical relations for convective heat transfer on plates and cylinders in horizontal and vertical orientation.

UNIT VI
HEAT TRANSFER WITH PHASE CHANGE: BOILING:

Pool boiling – Regimes, determination of heat transfer coefficient in Nucleate boiling, Critical Heat flux and Film boiling.
Condensation: Film wise and drop wise condensation –Nusselt's Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

UNIT VII
HEAT EXCHANGERS:

Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

UNIT VIII
RADIATION HEAT TRANSFER

Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities– laws of Planck, Wien, Kirchoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between gray bodies – radiation shields– electrical analogy for radiation networks.

TEXT BOOKS:
   1. Fundamentals of Engg. Heat and Mass Transfer / R.C. Sachdeva / New Age International

2. Fundamentals of Heat and Mass Transfer/M.Thirumaleswar/Pearson Edu.

REFERENCE BOOKS:
1. Heat Transfer – P.K.Nag/ TMH
2. Heat Transfer / Holman .J.P/TMH
3. Heat and Mass Transfer –Cengel- McGraw Hill.
4. Heat and Mass Transfer – R.K. Rajput – S.Chand & Company Ltd.
5. Heat and Mass Transfer-Kondandaraman
6. Fundamentals of Heat Transfer - Incropera & Dewitt / John Wiley Pub.
7. Thermal Engineering Data Book /B.S.Reddy and K.H.Reddy Rev. Edition/I.K.International

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

NOTE: Thermal Engineering data books are permitted in the examinations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
ANANTAPUR

B.Tech. IV -II Sem (Aero.E)   **T   P   C**
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(9A21807) AEROELASTICITY
(ELECTIVE-IV)

OBJECTIVE:
To elucitate the aero elastic Phenomena, formulations and solutions techniques for aerospace vehicles in flight and to incorporate the spin off benefits.

UNIT I
Introduction to Aero elasticity, Collars Triangle, Aerodynamics and interactions of Structural and Inertial forces Static and Dynamic Aero Elasticity Phenomena.

UNIT II
Simple Two dimensional idealization of flow, String Theory, Fredholm Integral equations of Second Kind Exact Solutions for simple rectangular wings.

UNIT III
Formulations of Structural Dynamics Equation and Coupling effects for panels and plates, Generalized coordinates, Lagrange's Equations of motion Hamilton's Principle Orthogonality conditions.

UNIT IV
Static Aero elastic Studies Divergences, control reversal, Aileron reversal speed, Aileron efficiency, lift distribution, Rigid and elastic wings.

UNIT V
Nondimentional Parameters, stiffness criteria, dynamic mass balancing - model experiments and dimensional similarity – flutter analysis.

UNIT VI
Formulation of Aero elastic Equations for a Typical Section, Quasi Steady Aerodynamic derivatives, modal equations Galerkins method of analysis.

UNIT VII

Stability of motion of Continua Torsion flexure flutter – Solution of flutter determinant, method of determining the classical flutter speed – Flutter Prevention and control.

UNIT VIII
Application of Aero Elasticity in Engineering Problems – Galloping of transmission lines, flow induces vibrations of tall slender structures and suspension Budges.

TEXT BOOKS :
1. An introduction to the Theory of Aeroelasticity, Fung Y.C. John Wiley and Sons,New York, 1985.
2. Aero-elasticity,Bisphlinghoft R.C., Ashlay.H and Halfmam.R, Addition Wiley Publishing Company.
3. Introduction to the study of Aircraft Vibrations and Flutter, Scnlan R.H. and Rosenbaum. R, McGraw Company New York 1981.

REFERENCE:
1. Principles of Aeroelasticity, Bisphlinghoft R. C. and Ashely, Johnwiley Company. 1998.

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

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