CHAPTER 1

GENERAL INFORMATION

1.1 Introduction

The necessity of establishing a technical institute for the Bangladesh Armed Forces was felt in the late eighties. In the absence of such an institution, officers of Bangladesh Armed Forces had been graduating from Bangladesh University of Engineering and Technology (BUET), Bangladesh Institute of Technology (BIT) and other foreign institutions of science and technology. With a view to meet the increasing demand for the development and dissemination of engineering and technological knowledge, Bangladesh Armed Forces established the Military Institute of Science and Technology (MIST) that promises to provide facilities for higher technical education both for the officers of Bangladesh Armed Forces as well as for civil students from home and abroad. The motto of MIST is "Technology for Advancement". Founded on 19 April 1998, MIST started its journey on 31 January 1999 by offering a four-year bachelor's degree on Civil Engineering. Bachelor degree on Computer Science Engineering course started on 2001**.** Bachelor courses on Electrical, Electronic & Communication Engineering and Mechanical Engineering started its journey from 2003. Bachelor of Science program on Aeronautical Engineering (AE) has started from Feb 2009.

1.2 Objectives

The objectives of MIST are as follows:

- To establish a prestigious academic institute for studies in different fields of engineering and technology for military personnel and civil officials/ students from home and abroad at degree and post graduate levels.
- To organise courses on military science, technology and management in various arenas of interest.
- To hold examinations and confer certificates of diplomas/ degrees, other academic distinctions, to and on persons who have persuaded a course of study and have passed examinations conducted by the institute.
- To confer research degrees, award fellowship, scholarship, exhibition, prizes, medals and honorary degrees to persons who have carried out research works under conditions as prescribed in the MIST regulations.
- To establish teaching Divisions (Div), Departments (Dept), Centers, Faculties etc and to make necessary arrangements for their maintenance/ management/ administration.
- To make provisions for advisory, research and consultation service including supervisions, material testing and to enter into suitable agreement with any persons/ organisations for this purpose.
- To co-operate with Universities / Technical Institutions (both military and civil) including Memoranda of Understanding (MOU) at home and abroad, in the manner and purpose as the institute may determine.
- To do such other acts, related to above-mentioned objectives, as may be required in order to expand the objectives of the institute.

1.3 Capabilities

- To conduct under-graduate programs leading to B.Sc. Engineering Degrees in the following disciplines:

    - Civil Engineering (CE)
    - Computer Science and Engineering (CSE)
    - Electrical, Electronic and Communication Engineering (EECE)
    - Mechanical Engineering (ME) and
    - Aeronautical Engineering (AE)
    - Naval Architecture and Marine Engineering (NAME)
    - Bachelor of Architecture
    - Biomedical Engineering
    - Nuclear Science and Engineering
    - Environmental, Water Resources and Coastal Engineering

- To conduct post graduate/ masters and PhD program.
- To conduct diploma courses in surveying & mapping.
- To conduct diploma and certificate courses in CSE.
- To conduct professional advanced courses.

1.4 Location

MIST is located at Mirpur Cantonment, northwest edge of the greater Dhaka city, a hub of knowledge for the armed forces. Mirpur Cantonment is a small, calm and quiet education village and free from all possible pollution of a city life. A garland like lake with migratory birds, three sides with extended green fields in the summer and water bodies in the rainy season, whistling birds on the tree branches and overall bounty of nature adds to the already existing splendid academic atmosphere. Other neighboring academic institutions are National Defense College (NDC), Defense Services Command and Staff College (DSCSC) and Bangladesh University of Professionals (BUP).

1.5 Eligibility of Students for Admission in MIST

The students must fulfill the following requirements:

For Bangladeshi Students

Minimum qualifications to take part in the admission test are as follows:

- Applicants must have passed SSC/Dhakhil/equivalent examination from Board of Intermediate and Secondary Education/ Madrasa Education Board/ Technical Education Board in Science group with minimum GPA 4.00 (without fourth subject) in a 5-point scale.

- Applicants must have passed HSC/Alim/equivalent examination from Board of Intermediate and Secondary Education/ Madrasa Education Board/ Technical Education Board in Science group with minimum GPA 4.00 in a 5-point scale.

- In HSC/Alim/equivalent examination the applicant must have obtained minimum "A+" grade in any two (02) subjects out of five (05) subjects including Mathematics, Physics, Chemistry, English & Bangla and "A" grade in rest two (02) subjects.

- Applicants with GCE 'O' Level/equivalent background must have to qualify in minimum five (05) subjects including Mathematics, Physics, Chemistry and English language with minimum "B" grade in average [i.e. A= 5, B= 4, C= 3, D= 2 & E= 1, minimum required grade point = 20].

- Applicants with GCE 'A' Level/equivalent background must have to qualify in minimum three (03) subjects including Mathematics, Physics and Chemistry with minimum 'A' in ONE subject and 'B' grades in rest TWO subjects. [i.e. A= 5, B= 4, minimum required grade point = 13].

- Applicants who have passed HSC or equivalent examination in the current year or one year before the notification for admission can apply.

- Sex: Male and female.

For Foreign Students

Maximum 3% of overall vacancies available will be kept reserved for the foreign students and will be offered to foreign countries through AFD of the Government of the Peoples Republic of Bangladesh. Applicants must fulfill the following requirements:

- Educational qualifications as applicable for Bangladeshi civil students or equivalent.
- Must have security clearance from respective Embassy/ High Commission in Bangladesh.
- Sex: Male and female

1.6 Admission Procedure

1.6.1 Syllabus for Admission Test

- A merit list of eligible candidates will be prepared on the basis of total GPA of Mathematics, Physics, Chemistry and one-third GPA of English earned in HSC/ Alim/ equivalent examination. Out of the merit list only short listed (approximately 6000) candidates will be allowed to take part in the written admission test of three hours (For Unit A) and 3+1=4.0 hrs. (For Unit B and Unit A+B). However, all eligible candidates of reserved seats (Children of Military Personnel, Children of Freedom Fighters, Tribal Citizens) and all eligible applicants with GCE 'A' level/ equivalent background shall also be allowed to seat for admission test. The list of eligible candidates to appear admission test will be displayed in the notice board and website of MIST www.mist.ac.bd and will be intimated to individual through SMS to the contact mobile number given by the applicant.

- There will be no multiple choice type questions (MCQ). Question for written test will be based on the current syllabus HSC examination-2014. The marks distribution for both units is as follows:

Ser No	Module	Subject	Marks	Remarks
1	1 (For Unit A)	Mathematics	80	Total Marks: 200 Exam Duration: 3.0 Hrs
2		Physics	60	
3		Chemistry	40	
4		Functional English	20	
5	2 (For Unit B)	Drawing and Architecture related topics	100	Total Marks: 300 Exam Duration: 3.0+1.0 Hrs

1.6.2 Final Selection

- Minimum qualifying marks in the written admission test is 40% for both question module 1 and 2. But in special circumstances for fulfillment of specified number of seats, President Admission Committee may consider relaxation of this condition. Merit list of candidates for final selection and admission to MIST will be prepared on the basis of the following:
- Unit A (Engineering) and unit B (Architecture)
    - Written Admission Test: 75%
    - Total GPA of Mathematics, Physics and Chemistry of HSC/A level/equivalent examination: 15%
    - GPA of SSC/O level/equivalent examination (without 4th subject): 10%
- All applicants must obtain 40% of allocated marks separately for question module 1 and 2. A merit list will be generated based on aggregate marks for required vacancies.
- In case of tie, merit position will be determined on the basis of marks obtained in admission test in Mathematics, Physics, Chemistry and English respectively. Further dispute will be solved giving priority of result of HSC over SSC examination.

1.6.3 Medical Checkup

Civil candidates selected through admission test will go for medical checkup in MIST/CMH. If the medical authority considers any candidate unfit for study in MIST due to critical/contagious/mental diseases as shown in medical policy of MIST will be declared unsuitable for admission.

1.7 Students Withdrawal Policy

1.7.1 For Poor Academic Performance

In all the Degree of Engineering programs, it is expected that all military and civil students will earn degree by clearing all the offered courses in the stipulated time. In case of failure, the following policies will be adopted:

- Students failing in maximum two courses/subjects in any level, each comprising of two regular terms will be allowed to appear in the referred/re-examination on failed course(s)/subject(s) after a short term as per academic schedule.

- Referred/re-examination, after a short term is to be conducted within 02 (two) weeks of commencement of the next academic session at the latest.

- Students failing in maximum one course/subject in the referred/re-examination will be promoted to the next higher level. The failed course/subject will be termed as ‘Backlog’ subject and the students have to pass the ‘Backlog’ subject in the next scheduled referred/re-examination, but without any short term. Otherwise, he/she will be withdrawn permanently from the course/program.

- No student will be allowed to appear in the referred/re-examination in the same subject more than twice in the whole undergraduate program.

- Students in all levels will be allowed to appear in the referred/re-examination on two courses/subjects including the ‘Backlog’ one.

- Students will be promoted to the second term of each level irrespective of their results in the first term of the level.

- Students failing in three or more courses/subjects in any level, comprising of two regular terms, will be allowed to repeat the level once. Students repeating a level will be granted exemption for that/those subject(s) in which they earned ‘B+’ and above grade in the previous academic year. For a military student, repeating a level will be subject to the approval of the respective Services Headquarters.

- Students will be allowed to repeat a particular level only once in the whole undergraduate program.

- After level-4 referred/re-examination, if any military student fails in maximum one course/subject, but not the ‘Backlog’ subject, then he/she will leave MIST and will be allowed to appear in the next scheduled referred/re-examination of the respective course. In that examination if he/she cannot pass the course/subject, or if he/she does not appear in the referred examination within 06 (six) years of registration will lose the scope of completing graduation. This failure will also be recorded in the dossier of military student officers.

- In case of sickness, which leads to missing of more than 40% classes or miss term final examination (supported by requisite medical documents), students may be allowed to withdraw temporarily from that term and repeat the whole level with the regular level in the next academic session, subject to the approval of Academic Council, MIST. However, he/she has to complete the whole undergraduate program within 06 (six) academic years from the date of his/her registration.

- Whatever may be the cases, students have to complete the whole undergraduate program within 06 (six) academic years from the date of registration.

- Failure to secure/achieve minimum CGPA of 2.20 in two consecutive levels will also lead to withdrawal of the student from the program.

1.7.2 Expulsion/Withdrawal on Disciplinary Ground

Unfair Means

Adoption of unfair means may result in expulsion of a student from the program and so from the institution. The Academic Council of MIST will authorize such expulsion on the basis of recommendation of the Disciplinary Committee, MIST and as per policy approved by the affiliating university. Following would be considered as unfair means adopted during examinations and other contexts:

- Communicating with fellow students for obtaining help in the examination.
- Copying from another student's script/report/paper.
- Copying from desk or palm of a hand or from other incriminating documents.
- Possession of any incriminating document whether used or not.

Influencing Grades

Academic council of MIST may expel/withdraw any student for approaching directly or indirectly in any form to influence a teacher or MIST authority for grades.

Other Indiscipline Behavior

Academic council of MIST may withdraw/expel any student on disciplinary ground, if any form of indiscipline or unruly behavior is seen in him/her which may disrupt the academic environment/program or is considered detrimental to MIST's image.

Immediate Action by the Disciplinary Committee of MIST

The disciplinary committee, MIST may take immediate disciplinary action against any student of the institution. In case of withdrawal/expulsion, the matter will be referred to the academic council, MIST for post-facto approval.

1.7.3 Withdrawal on Own Accord

Permanent Withdrawal

A student who has already completed some courses and has not performed satisfactorily may apply for a permanent withdrawal.

Temporary Withdrawal

A student, if he/she applies, may be allowed to withdraw temporarily from the program, subject to the approval of academic council of MIST, but he/she has to complete the whole program within 06 (six) academic years from the date of his/her registration.

CHAPTER 2

DEPARTMENT OF AERONAUTICAL ENGINEERING (AE)

2.1 Introduction

The necessity of induction of Aeronautical Engineering (AE) program at Bangladesh has long been felt and MIST is the pioneer technical institute to introduce Aeronautical Engineering Program in Bangladesh. Compared to any other institute of engineering including BUET, MIST has the highest preparedness to introduce Aeronautical Engineering because of the requirement of defense where study and practice of Aeronautical Engineering is a part of service requirement as well as Aeronautical Engineering is required to introduce space based research in our country.

The proposed Aeronautical Engineering (AE) program has 02 (two) major disciplines namely "Aerospace" and "Avionics". The proposed syllabus comprises a total of 161.25 credits & 192.5 contact hours for Aerospace discipline and 161.50 credits & 195.00 contact hours for Avionics discipline.

Aeronautical Engineering plays a vital role in all fields of modern human activities. It has established itself as one of the most important branches of engineering. The Aeronautical Engineering undergraduate programme provides an excellent technical background for persons who want to work in the field of Aerodynamics, Jet Propulsion, Structural Analysis, Avionics and other disciplines. In addition to lectures and practical sessions in the classroom, the undergraduate programme also includes industrial/educational visits to different reputed industries/places both home and abroad. The new generation of Aeronautical engineers is encouraged to undertake research and development activities in the above areas and this department is committed to the study and analysis of fundamental as well as applied problems. Problems of military and national importance have consequently received great emphasis in the activities of this department.

In addition to the above in the future there will be opportunities for postgraduate studies and research leading to higher degrees i.e. M. Sc. (Engg), M. Engg, and Ph.D.

2.2 Laboratory Facilities of the Aeronautical Engineering Department

The department endeavors to provide its faculty members and students adequate laboratory, library and other facilities, Departmental undergraduate courses are laboratory intensive and these requirements are catered for by the following laboratories:

(1) Aerodynamics Lab
(2) Applied Aerodynamics Lab
(3) Aero-Fluid Mechanics and Machinery Lab
(4) Measurement and Quality Control Lab
(5) Temperature Control and Heat Transfer Lab
(6) Applied Mechanics Lab
(7) Aero-structure Lab
(8) Life Saving Equipment Lab
(9) Material Science Lab
(10) Pressurization & Air Conditioning Lab
(11) Aerospace Ground Equipment Lab

(12) Control (Mechatronics) Lab
(13) Machine Tools Lab
(14) Propulsion (Aero-engine) Lab
(15) Test and Measurement Lab
(16) CAD (Computer Aided Design) Lab
(17) Aero-Composite Material Lab
(18) Vibration and Noise Control Lab
(19) Aero-Non-Destructive Testing and Evaluation (NDTE) Lab
(20) Strength of Material Lab
(21) Avionics and Ground Electronics Lab
(22) Satellite and Inertial Navigation Lab
(23) Aero-Electrical and Electro-Mechanical Lab
(24) Airborne Electronics Lab
(25) Radar Engineering Lab
(26) Microwave Communication Lab
(27) Electronic Warfare (EW) & Stealth Technique Lab
(28) Aero-Satellite Communication & Remote Sensing Lab
(29) Aero-Weapon System Lab
(30) Aero Control (Dynamic Stability) Engineering Lab
(31) Digital Signal Processing (DSP) Lab
(32) Aero-Instrumentation (Avionics) Lab
(33) Sensor & Guidance Lab
(34) Missile Design Lab

Students in Level - 1 (fresher) and Level - 2 (sophomore) have to undertake laboratory courses (sessionals) in Physics, Chemistry, Workshop, Mechanical Engineering and Electrical Engineering. If necessary undergraduate students can have the access to the facilities of other departments and centers during their project, thesis and research works.

CHAPTER 3

RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAM

3.1 Number of Terms in a Year

There will be two regular terms (Term I and Term II) in an academic year. Those who will not be able to clear the courses of that year, will require to appear in the re-examination after a short term of about 6 weeks and fulfilling the other conditions as per examination policy.

3.2 Duration of Terms

The duration of each of Term will be as follows:

Events	**Durations**			**Remarks**
	Academic	Others	Total	
Classes	7 weeks			
Mid Term vacation		1 week		
Classes (7 weeks min), Makeup Class and Preparatory leave	9 Weeks			
Term Final Examination	2 weeks			
Term End Vacation		2 week		May change
Total	18 weeks	3 weeks	**21 weeks**	

The duration for short term and re examination will be as follows:

Short term/ Preparatory Leave	6 weeks*
Examination	1 weeks
Total	**7 Weeks**
* Duration may vary depending on the situation.	

3.3 Course Pattern and Credit Structure

The undergraduate program is covered by a set of theoretical courses along with a set of sessional courses to support them.

3.3.1 Course Designation System

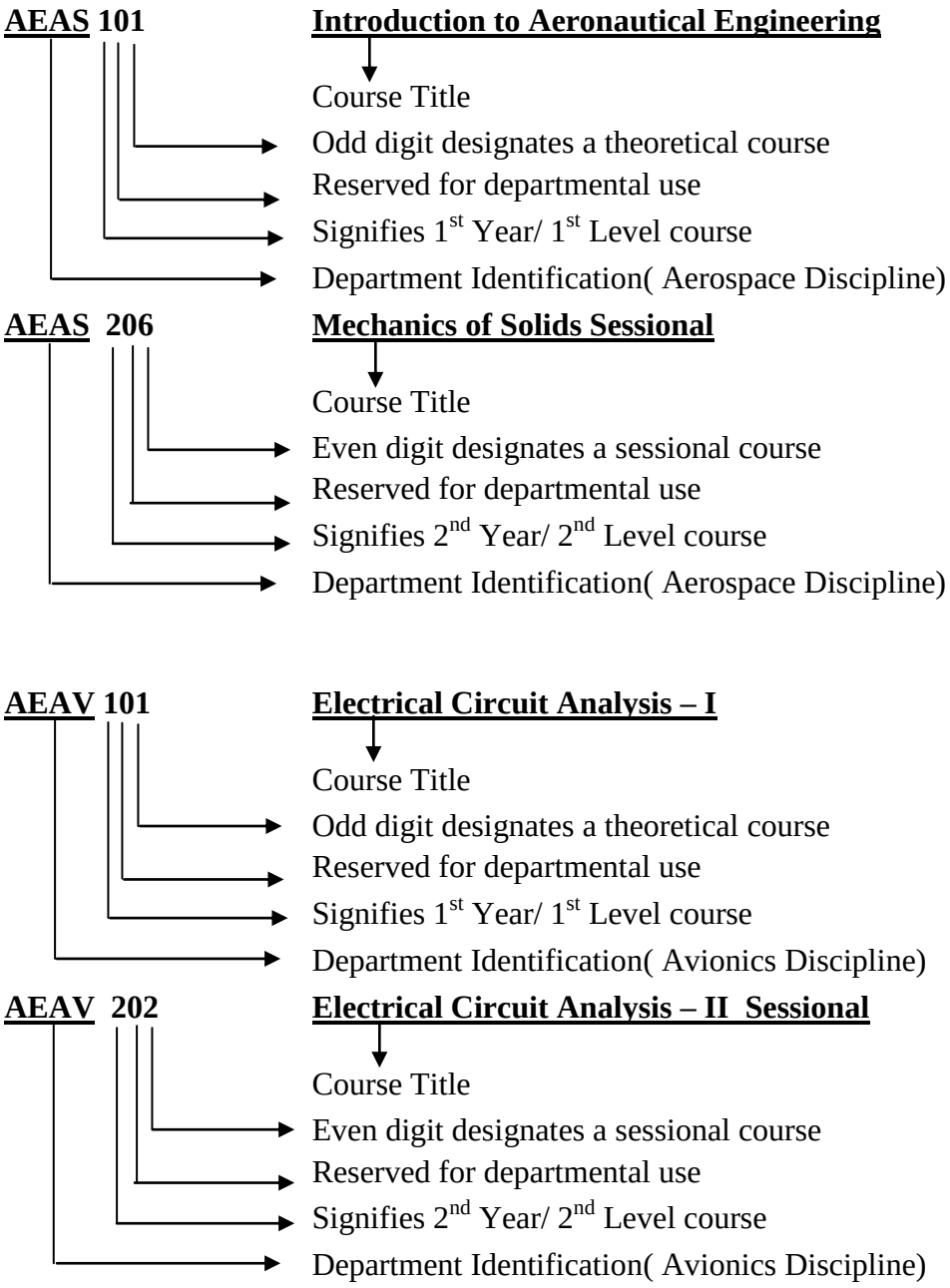
Each course is designated by a maximum of four letter code identifying the department offering the course followed by a three-digit number having the following interpretation:

- The left most digit corresponds to the year in which the course is normally taken by the students. The second digit is reserved for departmental use. It usually identifies a specific area/group of study within the department

- The right most digit is an odd number for theoretical courses and an even number for sessional courses.

- The course designation system is illustrated as follows:

(Example.....



3.3.2 Assignment of Credits

The assignment of credits for a theoretical course is different from that of a sessional course, which is stated as follows:

- For theoretical courses one hour lecture per week per term is equivalent to one credit.
- For sessional courses two hours sessional per week per term is equivalent to one credit.
- Credits are also assigned to project work taken by the students. The amount of credits assigned to such works may vary from one discipline to another.

3.3.3 Types of Courses

The courses included in the undergraduate curriculums are divided into the following groups:

- **Core Courses**
  In each discipline, a number of courses are identified as core courses, which form the nucleus of the respective bachelor's degree program. Students have to complete all of the designated core courses of their discipline.
- **Prerequisite Courses**
  Some of the core courses are identified as prerequisite courses for a specific subject. A prerequisite course is one, which is required to be completed before some other course(s) can be taken.
- **Elective Courses**
  Apart from the core courses, the students can choose from a set of Elective courses. A required number of Elective courses from a specified group has to be chosen.

3.4 The Grading System

3.4.1 The Letter Grade

The performance of a student in a given course is based on a scheme of continuous assessment. For theory courses this continuous assessment is made through a set of quizzes, class evaluation, class participation, homework assignment and a term final examination. The assessments in sessional courses are made by evaluating performance of the students at work during the class, viva-voce during laboratory hours and quizzes. Each course has a certain number of credits, which describes its corresponding weightages. A letter grade with a specified number of grade points is awarded in each course for which a student is registered. Student's performance is measured by the number of credits completed satisfactorily and by the weighted average of the grade points earned. A minimum grade point average (GPA) is essential for satisfactory progress. A minimum number of earned credits also have to be acquired in order to qualify for the degree. Letter grades and corresponding grade points will be

awarded in accordance to the provisions shown below:

Numerical Marks	Letter Grade	Grade Points
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
< 40%	F*	0.00
-	I	Incomplete
-	W	With drawn
-	X	Project/Thesis continuation
* Subject in which a student gets F grades shall not be counted towards credit hours requirements and for the calculation of Grade Point Average (GPA)		

3.4.2 Distribution of Marks(For Theoretical course only)

Thirty percent (30%) of marks of a theoretical course shall be allotted for continuous assessment, i.e. class tests, assignments, class evaluation and class participation. The rest of the marks will be allotted to the Term Final Examination that is conducted centrally by the BUP. There are internal and external examiners for each course in the Term Final Examination. Distribution of marks for a given course is as follows:

Class Participation/Observation	5%
Class Attendance	5%
Assignments and Class Tests	20%
Final Examination	70%
Total	**100%**

Basis for awarding marks for attendance will be as follows:

	Marks
90% and above	100%
85% to less than 90%	90%
80% to less than 85%	80%
75% to less than 80%	70%
70% to less than 75%	60%
65% to less than 70%	50%
60% to less than 65%	40%
Below 60%	00%

The number of Class Tests of a course shall be at least *n+1* where *n* is the number of credits of the course. Evaluation of performance in Class Tests will be on the basis of the best *n* Class Tests. The scheme of continuous assessment that a particular teacher wishes to follow for a course will be announced on the first day of classes.

3.4.3 Calculation of GPA

Grade Point Average (GPA) is the weighted average of the grade points obtained of all the courses passed/completed by a student. For example, if a student passes/completes *n* courses in a term having credits of $C_1, C_2, \ldots, C_n$ and his grade points in these courses are $G_1, G_2, \ldots, G_n$ respectively then

$$GPA = \frac{\sum_{i=1}^{n} C_i * G_i}{\sum_{i=1}^{n} C_i}$$

The Cumulative Grade Point Average (CGPA) is the weighted average of the GPA obtained in all the terms passed/completed by a student. For example, if a student passes/ completes n terms having total credits of $TC_1, TC_2, \ldots, TC_n$ and his GPA in these terms are $GPA_1, GPA_2, \ldots, GPA_n$ respectively then

$$CGPA = \frac{\sum_{i=1}^{n} TC_i * GPA_i}{\sum_{i=1}^{n} TC_i}$$

(Example.....

- **A Numerical Example**

Suppose a student has completed eight courses in a term and obtained the following grades:

Course	Credits, C_i	Grade	Grade Points, G_i	C_I*G_i
AEAS 110	1.50	A-	3.50	5.250
AEAS 101	3.00	A+	4.00	12.000
CHEM 105	3.00	A	3.75	11.250
MATH 121	3.00	B	3.00	9.000
HUM 111	3.00	B-	2.75	8.250
HUM 103	3.00	B	3.00	9.000
PHY 115	3.00	A+	4.00	12.000
CSE 112	1.50	A	3.75	5.625
Total	21.00			72.375

GPA = 72.375/21.00 = 3.45

Suppose a student has completed four terms and obtained the following GPA.

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Level	Term	Credit Hours Earned, TC_I	GPA Earned, GPA_i	GPA_i*TC_i
1	1	21.00	3.73	78.330
1	2	20.50	3.93	80.565
2	1	19.75	3.96	78.210
2	2	20.25	4.00	81.000
Total		**81.50**		**318.105**

CGPA = 318.105/81.50 = 3.90

3.4.4 Minimum Earned Credit and GPA Requirement for Obtaining Degree

Minimum credit hour requirements for the award of bachelor's degree in engineering (B.Sc. Engineering) and other discipline will be decided as per existing rules. The minimum CGPA requirement for obtaining a Bachelor's degree in engineering and other discipline is 2.20.

3.5 Absence during a Term

Students should not be absent from Class Tests etc. during the term. Such absence will naturally lead to reduction in points/marks, which count towards the final grade. Absence in the Term Final Examination for any reason will result in an F grade in the corresponding course. A student who has been absent for short periods, up to a maximum of three weeks due to illness, should approach the course teacher(s) or the course coordinator(s) for make-up Class Tests or assignments immediately upon return to classes. Such request has to be supported by medical certificate from competent authority (e.g. CMH).

CHAPTER 4

COURSE REQUIREMENTS FOR THE UNDERGRADUATE STUDY OF AERONAUTICAL ENGINEERING (AE)

4.1 Introduction

The list of courses offered to the Undergraduate students of Aeronautical Engineering (AE) is categorized into Core courses offered by the Department of AE, Elective courses and Courses offered by Science and Humanities Department. Students have the flexibility to choose from amongst the Elective courses. The proposed Aeronautical Engineering (AE) program has 02 (two) major disciplines namely "Aerospace" and "Avionics". The proposed syllabus comprises a total of 161.25 credits for "Aerospace" and 161.50 credits for "Avionics" disciplines. Core courses for the Aerospace and Avionics disciplines and other courses are listed in the following sections.

4.2 Core Courses

The students have to complete all the core courses listed below.

4.2.1 List of Core Courses for Aerospace Discipline

Ser. No	Course No	Course Name	Level/ Term	Contact Hours	Credits
1.	AEAS 101	Introduction to Aeronautical Engineering	1-I	3.0	3.00
2.	AEAS 110	Aeronautical Engineering Drawing –I	1-II	3.0	1.50
3.	AEAS 201	Engineering Mechanics (Statics and Dynamics)	2-I	4.0	4.00
4.	AEAS 203	Fundamentals of Fluid Mechanics	2-II	3.0	3.00
5.	AEAS 205	Mechanics of Solids	2-II	3.0	3.00
6.	AEAS 206	Mechanics of Solids Sessional	2-II	3.0	1.50
7.	AEAS 207	Thermodynamics	2-II	3.0	3.00
8.	AEAS 208	Thermodynamics Sessional	2-II	1.5	0.75
9.	AEAS 210	Aeronautical Engineering Drawing-II	2-II	3.0	1.50
10.	AEAS 215	Aircraft Systems	2-II	3.0	3.0
11.	AE 300	Industrial Training	3-II	4 weeks	1.00
12.	AEAS 301	Heat Transfer	3-I	3.0	3.00
13.	AEAS 303	Applied Aerodynamics and Computational Fluid Dynamics (CFD)	3-I	4.0	4.00
14.	AEAS 304	Applied Aerodynamics and CFD Sessional	3-I	3.0	1.50
15.	AEAS 305	Aerospace Propulsion	3-I	4.0	4.00
16.	AEAS 306	Aerospace Propulsion Sessional	3-I	1.5	0.75
17.	AEAS 307	Aircraft Loading & Structural Analysis	3-I	3.0	3.00
18.	AEAS 313	High Speed Aerodynamics	3-II	3.0	3.00
19.	AEAS 315	Aerospace Vehicle Stability and Control	3-II	3.0	3.00
20.	AEAS 317	Mechanics of Structure, Structural Vibration and Aero Elasticity	3-II	4.0	4.00
21.	AEAS 319	Machine Design	3-II	3.0	3.00
22.	AEAS 320	Machine Design Sessional	3-II	3.0	1.50
23.	AEAS 322	Heat Transfer Sessional	3-I	3.0	1.50
24.	AEAS 331	Materials Science & Aerospace Materials	3-I	3.0	3.00
25.	AEAS 332	Materials Science & Aerospace Materials Sessional	3-I	1.5	0.75
26.	AEAS 400	Project and Thesis	4-I+ 4-II	6.0 +6.0	3.00 +3.00
27.	AEAS 401	Computational Structural Analysis	4-II	3.0	3.00
28.	AEAS 407	Turbomachinery	4-II	3.0	3.00
29.	AEAS 416	Wind Tunnel Testing Sessional	4-I	1.5	0.75

Ser No	Course No	Course Name	Level/ Term	Contact Hours	Credits
30.	AEAS 437	Aerospace Vehicle Design	4-I	3.0	3.00
31.	AEAS 438	Aerospace Vehicle Design Sessional	4-I	3.0	1.5
32.	AEAS 439	Rotor dynamics and Aircraft Performance	4-I	3.0	3.00
33.	AEAS 445	Industrial & Business Management	4-II	3.0	3.00
34.	AEAS 447	Space Engineering	4-I	3.0	3.00
35	AEAV 101	Electrical Circuit Analysis-I	1-I	3.0	3.00
36.	AEAV 102	Electrical Circuit Analysis – I Sessional	1-I	3.0	1.50
37.	AEAV 103	Computer Programming and Applications	1-II	3.0	3.00
38.	AEAV 104	Computer Programming and Applications Sessional	1-II	3.0	1.50
39.	AEAV 205	Numerical Analysis and Application	2-I	3.0	3.00
40.	AEAV 206	Numerical Analysis and Application Sessional	2-I	3.0	1.50
41.	AEAV 203	Electronics-I	2-I	3.0	3.00
42.	AEAV 204	Electronics-I Sessional	2-I	1.5	0.75
43.	AEAV-329	Measurement and Aircraft Instruments	3-II	3.0	3.00
44.	AEAV-330	Measurement and Aircraft Instruments Sessional	3-II	3.0	1.50
45.	AEAV 451	Avionics Technology	4-II	3.0	3.00
46.	AEAV 452	Avionics Technology Sessional	4-II	1.5	0.75
47.	AEAV 461	Control Engineering	4-I	3.0	3.0
		Total	**-**	**142.0**	**116.0**

4.2.2 List of Core Courses for Avionics Discipline

Ser. No	Course No	Course Name	Level/ Term	Contact Hours	Credit Hours
1.	AEAV 101	Electrical Circuit Analysis-I	1-I	3.0	3.00
2.	AEAV 102	Electrical Circuit Analysis-I Sessional	1-I	3.0	1.50
3.	AEAV 103	Computer Programming and Applications	1-II	3.0	3.00
4.	AEAV 104	Computer Programming and Applications Sessional	1-II	3.0	1.50
5.	AEAV 201	Electrical Circuit Analysis-II	2 -I	3.0	3.00
6.	AEAV 202	Electrical Circuit Analysis-II Sessional	2 -I	1.5	0.75
7.	AEAV 203	Electronics-I	2 -I	3.0	3.00
8.	AEAV 205	Numerical Analysis and Application	2-I	3.0	3.00
9.	AEAV 206	Numerical Analysis and Application Sessional	2-I	3.0	1.50
10.	AEAV 215	Electronics-II	2-II	3.0	3.00
11.	AEAV 216	Electronics-II Sessional	2-II	3.0	1.50
12.	AEAV 217	Aircraft Electrical System	2-II	3.0	3.00
13.	AEAV 218	Aircraft Electrical System Sessional	2-II	1.5	0.75
14.	AEAV 301	Digital Systems	3-I	3.0	3.00
15.	AEAV 302	Digital Systems Sessional	3-I	3.0	1.50
16.	AEAV 303	Signals and Systems	3-I	3.0	3.00
17.	AEAV 305	Communication Engineering	3-II	3.0	3.00
18.	AEAV 306	Communication Engineering Sessional	3-II	1.5	0.75
19.	AEAV 307	Electromagnetic Field Theory	3-II	3.0	3.00
20.	AEAV 313	Digital Signal Processing	3-II	3.0	3.00
21.	AEAV 324	Digital Signal Processing Sessional	3-II	1.5	0.75
22.	AEAV 317	Aircraft Electronic Systems	3-I	3.0	3.00
23.	AEAV 318	Aircraft Electronic Systems Sessional	3-I	1.5	0.75
24.	AEAV 327	Aircraft Navigation System-I	3-II	3.0	3.00
25.	AEAV 329	Measurement and Aircraft Instruments	3-II	3.0	3.00
26.	AEAV 330	Measurement and Aircraft Instruments Sessional	3-II	3.0	1.50
27.	AE 300	Industrial Training	3-II	4 weeks	1.00
28.	AEAV 400	Project and Thesis	4-I &II	6.0 + 6.0	3.0+3.0
29.	AEAV 401	Microwave Engineering	4-I	3.0	3.00

Ser. No	Course No	Course Name	Level/ Term	Contact Hours	Credits
30.	AEAV 442	Microwave Engineering Sessional	4 - I	1.5	0.75
31.	AEAV 407	Radar Engineering	4-II	3.0	3.00
32.	AEAV 408	Radar Engineering Sessional	4-II	1.5	0.75
33.	AEAV 411	Control System Engineering	4-I	3.0	3.00
34.	AEAV 412	Control System Engineering Sessional	4-I	1.5	0.75
35.	AEAV 447	Aircraft Navigation System-II	4-II	3.0	3.00
36.	AEAV 448	Aircraft Navigation System-I Sessional	4-II	3.0	1.50
37.	AEAV 453	Aircraft Stability Control and Missile Guidance	4-II	3.0	3.00
38.	AEAS 101	Introduction to Aeronautical Engineering	1-I	3.0	3.00
39.	AEAS 110	Aeronautical Engineering Drawing – I	1-I	3.0	1.50
40.	AEAS 201	Engineering Mechanics (Statics and Dynamics)	2-II	4.0	4.00
41.	AEAS 203	Fundamentals of Fluid Mechanics	2-II	3.0	3.00
42.	AEAS 207	Thermodynamics	2-II	3.0	3.00
43.	AEAS 208	Thermodynamics Sessional	2-II	1.5	0.75
44.	AEAS 210	Aeronautical Engineering Drawing –II	2-II	3.0	1.50
45.	AEAS 303	Applied Aerodynamics and Computational Fluid Dynamics (CFD)	3-I	4.0	4.00
46.	AEAS 304	Applied Aerodynamics and CFD Sessional	3-I	3.0	1.50
47.	AEAS 445	Industrial and Business Management	4-I	3.0	3.00
48.	AEAS 433	Aerospace Technology	4-I	3.0	3.0
49.	AEAS 434	Aerospace Technology Sessional	4-I	1.5	0.75
50.	AEAS 447	Space Engineering	4-I	3.0	3.00
		Total	**-**	**143.0**	**115.5**

4.2.3 Courses offered by Other Departments

Ser. No	Course No	Course Name	Level - Term	Contact Hour	Credits
1.	SHOP 108	Workshop Technology Sessional –I	1-I	1.5	0.75
2.	SHOP 112	Workshop Technology Sessional –II	1-II	1.5	0.75
3.	PHY 115	Physics I (Waves and Oscillation, Optics and Thermal Physics)	1-I	3.0	3.00
4.	PHY 116	Physics Sessional	1-I	3.0	1.50
5.	PHY 117	Phy II (Electricity and Magnetism, Modern Physics and Mechanics)	1-II	3.0	3.00
6.	CHEM 105	Chemistry (Atomic Structure, Thermo-chemistry and Chemistry of Engineering Materials)	1-II	4.0	4.00
7.	CHEM 106	Chemistry Sessional	1-II	3.0	1.50
8.	MATH 121	Math I (Differential and Integral Calculus)	1-I	3.0	3.00
9.	MATH 123	Math II (Complex Variables and Vector Analysis)	1-I	3.0	3.00
10.	MATH 125	Math III (Ordinary and Partial Differential Equations and Laplace Transforms)	1-II	3.0	3.00
11.	MATH 221	Math IV (Matrices, Coordinate Geometry and Harmonic Analysis)	2-I	3.0	3.00
12.	MATH 225	Math V (Fourier Analysis and Statistics)	2-II	3.0	3.00
13.	HUM 111	English	1-II	3.0	3.00
14.	HUM 112	Technical Report Writing and Presentation	1-II	3.0	1.50
15	HUM XXX	Select form the prescribed courses	2-I	3.0	3.00
16	HUM YYY	Select from the prescribed courses	2-II	3.0	3.00
		Total	**-**	**46.0**	**40.00**

4.2.4 Courses offered by AE Department to ME students

Ser. No	Course No	Course Name	Level - Term	Contact Hour	Credits
1.	AEAS 449	Aerodynamics	4-I or 4-II	3.0	3.00
2.	AEAS 451	Aircraft & Aero-engine Structure	4-I or 4-II	3.0	3.00
3.	AEAS 453	Applied Aerodynamics	4-I or 4-II	3.0	3.00
4.	AEAS 455	Aircraft stability and control and Aircraft systems	4-I or 4-II	3.0	3.00

4.3 Summary of Credits

Aerospace Discipline

Core courses offered by AE Department	**=**	**116.00**
Courses offered by other Departments	**=**	**40.00**
Elective courses offered by AE Department	**=**	**6.00**
Total Credits	**=**	**162.00**

Avionics Discipline

Core courses offered by AE Department	**=**	**115.50**
Courses offered by other Departments	**=**	**40.00**
Elective courses offered by AE Department	**=**	**6.00**
Total Credits	**=**	**161.50**

4.4 Final Year Project/Thesis

Project/thesis will have to be undertaken by students under a supervisor in partial fulfillment of the requirement of his/her degree. Credits allotted to the project/thesis will be 6 corresponding to 12 contact hours.

4.4.1 Term wise Distribution of Courses

LEVEL 1, TERM-I (Aerospace & Avionics)

Course No	Course Name	Type of Course	Contact hours	Credits	Pg No
PHY 115	Physics I (Waves and Oscillation, Optics and Thermal Physics)	Theory	3	3.00	73
AEAV 101	Electrical Circuit Analysis-I	Theory	3	3.00	54
MATH 121	Math I (Differential and Integral Calculus)	Theory	3	3.00	75
MATH 123	Math II (Complex Variables and Vector Analysis)	Theory	3	3.00	76
AEAS 101	Introduction to Aeronautical Engineering	Theory	3	3.00	29
Subtotal (Theory)			**15**	**15.00**	
PHY 116	Physics Sessional	Sessional	3	1.50	74
AEAV 102	Electrical Circuit Analysis-I Sessional	Sessional	3	1.50	54
SHOP 108	Workshop Technology Sessional -I	Sessional	1.5	0.75	82
AEAS 110	Aeronautical Engineering Drawing-1	Sessional	3	1.50	30
Subtotal (Sessional)			**10.5**	**5.25**	
Total = Contact hours: 25.5; Credits: 20.25					

LEVEL 1, TERM-II (Aerospace & Avionics)

Course No	Course Name	Type of Course	Contact hours	Credits	Pg No
PHY 117	Phy II (Electricity and Magnetism, Modern Physics and Mechanics)	Theory	3	3.00	74
CHEM 105	Chemistry (Atomic Structure, Thermo-chemistry and Chemistry of Engineering Materials)	Theory	4	4.00	75
MATH 125	Math III (Ordinary and Partial Differential Equations and Laplace Transforms)	Theory	3	3.00	77
AEAV 103	Computer Programming and Applications	Theory	3	3.00	55
HUM 111	English	Theory	3	3.00	79
Subtotal (Theory)			**16**	**16.00**	
HUM 112	Technical Report Writing and Presentation	Sessional	3	1.50	79
CHEM 106	Chemistry Sessional	Sessional	3	1.50	75
AEAV 104	Computer Programming and Applications Sessional	Sessional	3	1.50	55
SHOP 112	Workshop Technology Sessional -II	Sessional	1.5	0.75	83
Subtotal (Sessional)			**10.5**	**5.25**	
Total = Contact hours: 26.5; Credits: 21.25					

LEVEL 2, TERM-I (Aerospace)

Course No	Course Name	Type of course	Contact hours	Credits	Pg No
AEAS 201	Engineering Mechanics (Statics and Dynamics)	Theory	4	4.00	31
AEAV 205	Numerical Analysis and Application	Theory	3	3.00	57
AEAV 203	Electronics-I	Theory	3	3.00	56
MATH 221	Math IV (Matrices, Coordinate Geometry and Harmonic Analysis)	Theory	3	3.00	77
HUM XXX	Select from prescribed courses	Theory	3	3.00	
		Subtotal (Theory)	**16**	**16**	
AEAV 206	Numerical Analysis and Application Sessional	Sessional	3	1.50	58
AEAV 204	Electronics-I Sessional	Sessional	1.5	0.75	57
		Subtotal (Sessional)	**4.50**	**2.25**	
Total = Contact hours: 20.50; Credits: 18.25					

LEVEL 2, TERM-I (Avionics)

Course No	Course Name	Type of course	Contact hours	Credits	Pg No
AEAV 201	Electrical Circuit Analysis-II	Theory	3	3.00	56
AEAV 203	Electronics-I	Theory	3	3.00	56
AEAV 205	Numerical Analysis and Applications	Theory	3	3.00	57
AEAS 201	Engineering Mechanics (Statics and Dynamics)	Theory	4	4.00	31
MATH 221	Math IV (Matrices, Coordinate Geometry and Harmonic Functions)	Theory	3	3.00	77
HUM XXX	Select form the prescribed courses	Theory	3	3.00	
		Subtotal (Theory)	**19**	**19.00**	
AEAV 202	Electrical Circuit Analysis-II Sessional	Sessional	1.5	0.75	56
AEAV 206	Numerical Analysis and Applications Sessional	Sessional	3.0	1.5	58
		Subtotal (Sessional)	**4.5**	**2.25**	
Total = Contact hours : 23.50; Credit hours : 21.25					

Note: List of Hum XXX is given in para 4.4.2 (Page No 25)

LEVEL 2, TERM-II (Aerospace)

Course No	Course Name	Type of course	Contact hours	Credits	Pg No
AEAS 203	Fundamentals of Fluid Mechanics	Theory	3	3.00	31
AEAS 205	Mechanics of Solids	Theory	3	3.00	32
AEAS 207	Thermodynamics	Theory	3	3.00	32
AEAS 215	Aircraft Systems	Theory	3	3.00	34
MATH 225	Math V (Fourier Analysis and Statistics)	Theory	3	3.00	78
HUM YYY	Select from prescribed courses	Theory	3	3.00	
	Subtotal (Theory)		**18**	**18.00**	
AEAS 206	Mechanics of Solids Sessional	Sessional	3.0	1.50	32
AEAS 208	Thermodynamics Sessional	Sessional	1.5	0.75	33
AEAS 210	Aeronautical Engineering Drawing-II	Sessional	3.0	1.50	33
	Subtotal (Sessional)		**7.5**	**3.75**	
	Total = Contact hours: 25.5; Credits: 21.75				

LEVEL 2, TERM-II (Avionics)

Course No	Course Name	Type of course	Contact hours	Credits	Pg No
AEAV 215	Electronics-II	Theory	3	3.00	58
AEAV 217	Aircraft Electrical System	Theory	3	3.00	59
AEAS 203	Fundamentals of Fluid Mechanics	Theory	3	3.00	31
AEAS 207	Thermodynamics	Theory	3	3.00	32
MATH 225	Math V (Fourier Analysis and Statistics)	Theory	3	3.00	78
	Subtotal (Theory)		**15**	**15.00**	
AEAV 216	Electronics-II Sessional	Sessional	3	1.50	58
AEAV 218	Aircraft Electrical System Sessional	Sessional	1.5	0.75	59
AEAS 208	Thermodynamics Sessional	Sessional	1.5	0.75	33
AEAS 210	Aeronautical Engineering Drawing-II	Sessional	3.0	1.50	33
	Subtotal (Sessional)		**9.0**	**4.50**	
	Total = Contact hours : 24.0 ; Credits hours : 19.50				

Note: List of HUM YYY is given in para 4.4.2 (Page No 25)

LEVEL 3, TERM-I (Aerospace)

Course No	Course Name	Type of course	Contact hours	Credits	Pg No
AEAS-301	Heat Transfer	Theory	3	3.00	35
AEAS-303	Applied Aerodynamics and Computational Fluid Dynamics (CFD)	Theory	4	4.00	36
AEAS-305	Aerospace Propulsion	Theory	4	4.00	37
AEAS-307	Aircraft Loading & Structure Analysis	Theory	3	3.00	38
AEAS-331	Material Science & Aerospace Materials	Theory	3	3.00	40
		Subtotal (Theory)	**17**	**17.00**	
AEAS-324	Applied Aerodynamics and CFD Sessional	Sessional	3	1.5	36
AEAS-306	Aerospace Propulsion Sessional	Sessional	1.5	0.75	37
AEAS-322	Heat Transfer Sessional	Sessional	3	1.5	35
AEAS-332	Material Science & Aerospace Materials Sessional	Sessional	1.5	0.75	41
		Subtotal (Sessional)	**9.0**	**4.50**	
		Total = Contact hours : 26.00 ; Credits : 21.50			

LEVEL – 3, TERM – I (Avionics)

Course No	Course Name	Type of course	Contact hours	Credits	Pg No
AEAV 301	Digital Systems	Theory	3	3.00	59
AEAV 303	Signals and Systems	Theory	3	3.00	60
AEAV-317	Aircraft Electronic Systems	Theory	3	3.00	63
AEAS 303	Applied Aerodynamics and Computational Fluid Dynamics (CFD)	Theory	4	4.00	36
HUM YYY	Select from the prescribed courses (YYY)	Theory	3	3.00	
		Subtotal (Theory)	**16**	**16.00**	
AEAV 302	Digital Systems Sessional	Sessional	3	1.50	60
AEAV 318	Aircraft Electronic System Sessional	Theory	1.5	0.75	63
AEAS 324	Applied Aerodynamics and CFD Sessional	Sessional	3	1.50	36
		Subtotal (Sessional)	**9.00**	**4.50**	
		Total = Contact hours : 25.00 ; Credits hours :20.50			

Note: List of Hum YYY is given in para 4.4.2 (Page No 25)

LEVEL 3, TERM-II (Aerospace)

Course No	Course Name	Type of course	Contact hours	Credits	Pg No
AEAS 313	High Speed Aerodynamics	Theory	3	3.00	38
AEAS 315	Aerospace Vehicle Stability and Control	Theory	3	3.00	39
AEAS 317	Mechanics of Structures, Structural Vibration and Aero Elasticity	Theory	4	4.00	39
AEAS 319	Machine Design	Theory	3	3.00	40
AEAV 329	Measurement and Aircraft Instruments	Theory	3	3.00	64
	Subtotal (Theory)		**16**	**16.00**	
AE-300	Industrial Training	Sessional	4 Weeks	1.00	35
AEAS 320	Machine Design Sessional	Sessional	3.0	1.50	40
AEAV 330	Measurement and Aircraft Instruments Sessional	Sessional	3.0	1.50	65
	Subtotal (Sessional)		**6.0**	**4.0**	
	Total = Contact hours : 22.00; Credits : 20.00				

LEVEL –3, TERM – II (Avionics)

Course No	**Course Name**	Type of course	Contact hours	Credits	Pg No
AEAV 305	Communication Engineering	Theory	3	3.00	61
AEAV 307	Electro-Magnetic Field Theory	Theory	3	3.00	61
AEAV 313	Digital Signal Processing	Theory	3	3.00	62
AEAV 327	Aircraft Navigation System-I	Theory	3	3.00	63
AEAV 329	Measurement and Aircraft Instruments	Theory	3	3.00	64
	Subtotal (Theory)		**15.0**	**15.00**	
AE 300	Industrial Training	Sessional	4 weeks	1.00	35
AEAV 306	Communication Engineering Sessional	Sessional	1.5	0.75	61
AEAV 324	Digital Signal Processing Sessional	Sessional	1.5	0.75	63
AEAV 330	Measurement and Aircraft Instruments Sessional	Sessional	3.0	1.50	65
	Subtotal (Sessional)		**6.0**	**4.00**	
	Total = Contact hours : 21 ; Credit hours : 19				

LEVEL 4, TERM-I (Aerospace)

Course No	Course Name	Type of course	Contact hours	Credits	Pg No
AEAS 437	Aerospace Vehicle Design	Theory	3	3.00	43
AEAS 439	Rotor-dynamics and Aircraft Performance	Theory	3	3.00	43
AEAS 447	Space Engineering	Theory	3	3.00	45
AEAV 461	Control Engineering	Theory	3	3.00	73
AEAS XXX	Select from prescribed optional courses	Theory	3	3.00	
		Subtotal (Theory)	**15**	**15.00**	
AEAS 400	Project and Thesis	Sessional	6.0	3.00	41
AEAS 416	Wind Tunnel Testing Sessional	Sessional	1.5	0.75	42
AEAS 438	Aerospace Vehicle Design Sessional	Sessional	3	1.5	43
		Subtotal (Sessional)	**10.5**	**5.25**	
			Total = Contact hours : 25.5 ; Credits : 20.25		

LEVEL – 4, TERM – I (Avionics)

Course No	Course Name	Type of course	Contact hours	Credits	Pg No
AEAV 401	Microwave Engineering	Theory	3	3.00	65
AEAV 411	Control Systems Engineering	Theory	3	3.00	67
AEAS 433	Aerospace Technology	Theory	3	3.00	53
AEAS-447	Space Engineering	Theory	3	3.00	45
AEAV XXX	Selected from prescribed optional courses	Theory	3	3.00	
		Subtotal (Theory)	**15**	**15.00**	
AEAV 400	Project and Thesis	Sessional	6.0	3.00	65
AEAV 412	Control Systems Engineering Sessional	Sessional	1.5	0.75	67
AEAS 434	Aerospace Technology Sessional	Sessional	1.5	0.75	54
AEAV 442	Microwave Engineering Sessional	Sessional	1.5	0.75	66
		Subtotal (Sessional)	**10.5**	**5.25**	
			Total = Contact hours :25.5; Credit hours : 20.25		

Note: List of AEAS/AEAV XXX and AEAS/AEAV YYY is given in para 4.4.3 & 4.4.4

LEVEL 4, TERM-II (Aerospace)

Course No	Course Name	Type of course	Contact hours	Credits	Pg No
AEAS-401	Computational Structural Analysis	Theory	3	3.00	41
AEAS-407	Turbo Machinery	Theory	3	3.00	42
AEAS 445	Industrial and Business Management	Theory	3	3.00	44
AEAV-451	Avionics Technology	Theory	3	3.00	72
AEAS-YYY	Select from prescribed optional courses	Theory	3	3.00	
Subtotal (Theory)			**15**	**15.00**	
AEAS-400	Project and Thesis	Sessional	6.0	3.00	41
AEAV-452	Avionics Technology Sessional	Sessional	1.5	0.75	73
Subtotal (Sessional)			**7.5**	**3.75**	
Total = Contact hours : 22.50 ; Credits : 18.75					

LEVEL – 4, TERM – II (Avionics)

Course No	**Course Name**	Type of course	Contact hours	Credits	Pg No
AEAV 407	Radar Engineering	Theory	3	3.00	66
AEAV 447	Aircraft Navigation System– II	Theory	3	3.00	67
AEAV-453	Aircraft Stability Control and Missile Guidance	Theory	3	3.00	68
AEAS 445	Industrial and Business Management	Theory	3	3.00	44
AEAV YYY	Select from prescribed optional courses	Theory	3	3.00	
Subtotal (Theory)			**15**	**15.00**	
AEAV 400	Project and Thesis	Sessional	6	3.00	65
AEAV 408	Radar Engineering Sessional	Sessional	1.5	0.75	66
AEAV 448	Aircraft Navigation System– II Sessional	Sessional	3	1.5	68
Subtotal (Sessional)			**10.5**	**5.25**	
Total = Contact hours : 25.5 Credit hours : 20.25					

Note: List of AEAS/AEAV XXX and AEAS/AEAV YYY is given in para 4.4.3 & 4.4.4

4.4.2 List of Humanities Courses (HUM XXX, HUM YYY)

Students can choose from a number of humanities courses as follows, offered by Humanities Department:

For Level-03:
Hum 305: Economics
Hum 307: Government

For Level-02:
Hum 209: Sociology
Hum 211: Principles of Accounting
Hum 221: Engineering Ethics.

4.4.3 List of Elective Courses for Aerospace Discipline

Please note that any two courses may be taken by each student from the following list of courses.

Ser No	Course No	Course Name	Level-Term	Contact Hours	Credits	Pg No
1.	AEAS 419	Maintenance Management and Repair of Aircraft	4-I/4-II	3.0	3.00	46
2	AEAS 421	Aviation Safety	4-I/4-II	3.0	3.00	46
3.	AEAS 423	Aerospace Management	4-I/4-II	3.0	3.00	47
4.	AEAS 425	Pressurization and Air Conditioning systems	4-I/4-II	3.0	3.00	47
5.	AEAS 427	Noise Control and Vibration	4-I/4-II	3.0	3.00	48
6.	AEAS 429	Rotorcraft Performance	4-I/4-II	3.0	3.00	48
7.	AEAS 431	Weapons Engineering	4-I/4-II	3.0	3.00	49
8.	AEAS 435	Aircraft Structural Design	4-I/4-II	3.0	3.00	49
9.	AEAS 455	Human Performance and Limitations	4-I/4-II	3.0	3.00	50
10.	AEAS 457	Airworthiness Legislations	4-I/4-II	3.0	3.00	51
11.	AEAS 459	Entrepreneurship Development	4-I/4-II	3.0	3.00	52
12.	AEAS 461	Advanced Materials Processing Technologies	4-I/4-II	3.0	3.00	52
13.	AEAS 463	Fluid Power and Control	4-I/4-II	3.0	3.00	53

4.4.4 List of Elective Courses for Avionics Discipline

Please note that any two courses may be taken by each student from the following list of courses.

Ser No	Course No	Course Name	Level-Term	Contact Hours	Credits	Pg No
1.	AEAV 413	Mobile Cellular Communication	4-I/4-II	3.0	3.00	69
2	AEAV 415	Satellite Communication	4-I/4-II	3.0	3.00	69
3.	AEAV 417	Optoelectronics	4-I/4-II	3.0	3.00	70
4.	AEAV 419	Electronics Warfare	4-I/4-II	3.0	3.00	70
5.	AEAV 421	Optical Fiber Communication	4-I/4-II	3.0	3.00	71
6.	AEAV 435	Computer Networks	4-I/4-II	3.0	3.00	71
7.	AEAS 419	Maintenance Management and Repair of Aircraft	4-I/4-II	3.0	3.00	46
8.	AEAS 421	Aviation Safety	4-I/4-II	3.0	3.00	46
9.	AEAS 423	Aerospace Management	4-I/4-II	3.0	3.00	47
10.	AEAS 431	Weapons Engineering	4-I/4-II	3.0	3.00	49
11.	AEAS 455	Human Performance and Limitations	4-I/4-II	3.0	3.00	51
12.	AEAS 457	Airworthiness Legislations	4-I/4-II	3.0	3.00	51
13.	AEAS 459	Entrepreneurship Development	4-I/4-II	3.0	3.00	52
14.	AEAV 409	Microprocessors and Interfacing	4-I/4-II	3.0	3.00	73

NOTE: Any two courses may be offered.

4.4.5 Contact Hours and Credits in Eight Terms

Aerospace Discipline

Level Term	Contact hours for theory courses	Contact hours for sessional courses	Total contact hours	Total credits
1-1	15.0	10.5	25.5	20.25
1-II	16.0	10.5	26.5	21.25
2-I	16.0	4.5	20.5	18.25
2-II	18.0	7.5	25.5	21.75
3-I	17.0	9.0	26.0	21.50
3-II	16.0	6.0	22.0	20.00
4-I	15.0	10.5	25.5	20.25
4-II	15.0	7.5	22.5	18.75
Total	**128.0**	**66.0**	**194.00**	**162.00**

Avionics Discipline

Level Term	Contact hours for theory courses	Contact hours for sessional courses	Total contact hours	Total credit hours
1-1	15	10.5	25.5	20.25
1-II	16	10.5	26.5	21.25
2-I	19	4.5	23.5	21.25
2-II	15	9.0	24.0	19.50
3-I	16	9.0	25.0	20.50
3-II	15	4.5	19.5	18.25
4-I	15	10.5	25.5	20.25
4-II	15	10.5	25.5	20.25
Total	**126.0**	**69.00**	**195.00**	**161.50**

4.5 Distribution of Credits for Different Categories of Courses

Aerospace Discipline

Level-Term	Humanities Cr Hr	Math Cr Hr	Basic Science Cr Hr	Dept Engg Cr Hr	Optional Courses Cr Hr	Total Cr Hr
1-I	-	6+0.0	3+1.5	6+3.75	-	20.25
1-II	3+1.5	3+0.0	7+1.5	3+2.25	-	21.25
2-I	3+0.0	3+0.0	-	10+2.25	-	18.25
2-II	3+0.0	3+0.0	-	12+3.75	-	21.75
3-I	-	-	-	17+4.5	-	21.50
3-II	-	-	-	16+4.0	-	20.00
4-I	-	-	-	12+5.25	3.0	20.25
4-II	-	-	-	12+3.75	3.0	18.75
% of total theory course	7.03%	11.71%	7.81%	68.75%	4.65%	
% of total course	6.50%	9.30%	8.06%	72.40%	3.72%	
Total Cr Hr	**10.5**	**15.0**	**13.0**	**116.75**	**6.0**	**162.00**

Avionics Discipline

Level-Term	Humanities Cr Hr	Math Cr Hr	Basic Science Cr Hr	Dept Engg Cr Hr	Optional Courses Cr Hr	Total Cr Hr
1-I	-	6+0.0	3+1.5	6+3.75	-	20.25
1-II	3+1.5	3+0.0	7+1.5	3+2.25	-	21.25
2-I	3+0.0	3+0.0	-	13+2.25	-	21.25
2-II	-	3+0.0	-	12+4.5	-	19.50
3-I	3+0.0	-	-	13+4.5	-	20.50
3-II	-	-	-	15+3.25	-	18.25
4-I	-	-	-	12+5.25	3	20.25
4-II	-	-	-	12+5.25	3	20.25
% of total theory course	7.14%	11.90%	7.94%	68.25%	4.76%	-
% of total course	6.50%	9.29%	8.05%	72.45%	3.72%	-
Total Cr Hr	**10.5**	**15.0**	**13.0**	**117.00**	**6.0**	**161.50**

CHAPTER 5

COURSE CONTENTS

Core and Specialized Courses Offered by Aerospace discipline

AEAS 101: Introduction to Aeronautical Engineering

3.00 Contact Hour 3.00 Credit Hour

Introduction to Aerospace Engineering:

Introduction to aerodynamics, astronautics, aircraft and spacecraft; Fixed and rotary wing aircraft; Basic forces acting on an aircraft, mechanics of flight. Modern developments and future trends in aerospace technologies.

Standard atmosphere; Local & free stream characteristics; Air Speed and Ground speed, flow over airofoils, Lift, drag, High lift devices; aircraft performance parameters such as endurance, aircraft ceiling and range.

Aircraft maneuvers - climb, descent and glide, take off, cruise, landing**.**

Aircraft structure: Aircraft basic configurations; Aerospace structures – familiarization to construction of wing, fuselage, horizontal stabilizer, vertical stabilizer, primary and secondary control surfaces and landing gear.

Aero-engine: Principles of Jet reaction; Types of aero-engine - familiarization to reciprocating and gas turbine engine along with their accessories.

Introduction to Avionics Engineering:

Instrumentation: Introduction to the cockpit and its instruments; Basic 6 instruments and their functions;

Aircraft communication: Fundamentals of aircraft communication system
Navigation systems: Fundamentals of aircraft navigation system

Text and Ref books:

1. Airframe and Power Plant – C A Zweng; Galotia Publications.
2. Spacecraft Systems Engineering –Peter Fortescue and John Stark; John Wiley and Sons.
3. Introduction to Flight -John D Anderson Jr; Tata McGraw-Hill.
4. Introduction to Aerospace structural Analysis –David H Allen, Publisher ; Weley and Sons.
5. Avionics Navigation Systems, 2nd Ed – Myron Kayton
6. Aerodynamics – Clancy
7. Flight without Formulae – Kermode

8. Fundamentals of Aerodynamics- John D. Anderson; McGraw-Hill

AEAS 110: Aeronautical Engineering Drawing-I

3.00 Contact Hour 1.50 Credit Hour

Introduction; Basic concepts of engineering drawing.

Instruments and their uses: Instruments that are used for engineering drawing; how the instruments are used.

Dimensioning: direction of dimensions, dimensioning in limited space, dimensioning of angles, dimensioning in circular features, dimensioning in cylindrical Holes, dimensioning in slotted holes, oblique dimensioning.

Orthographic projection: Types of projections, third angle projection, first angle projection method of projecting views, fillets and rounds.

Sectional views and conventions: Section Lining, types of section, full section, half section, broken-out section, revolved section.

Auxiliary view: generating auxiliary view, auxiliary view with circular feature, multiple auxiliary views

Pictorial drawing: perspective view, isometric projection, making isometric view, making isometric view with circular features, oblique projection.

Surface development: objects in unfolding condition, development of a hexagonal prism, right cylinder, right pyramid, right cone, oblique pyramid, oblique cone.

Workings drawings: detail drawing, assembly drawing, standard parts

Text and Ref books:

1. Fundamentals of Engineering Drawing; French & Vierck.
2. Metric Drafting – Paul Wallah; Glenceo Publishing Co, Inc; 1979.
3. Drafting Technology and Practice – William P. Spence; Chas A. Bennett Co, Inc, 1973.
4. Mechanical Engineering Drawing- Dr. Amalesh Chandra Mandal, Dr. Md. Quamrul Islam
5. Engineering Drawing- P. S. Gil
6. Engineering Drawing & Design – David A. Madsen, David P. Madsen
7. Engineering Drawing & Design – Cedl Jensen, Jay D. Helsel

AEAS 201: Engineering Mechanics (Statics and Dynamics)

4.00 Contact Hour 4.00 Credit Hour

Basic concepts of mechanics; Statics of particles and rigid bodies; Properties of forces, moments, couples and resultants; Analysis of two and three dimensional problems; Centroids of lines, areas and volumes; Forces in truss, frames, and cables; Friction; Moments of inertia of areas and masses; Relative motion.

Planar mechanisms, linkages, mobility; instant centers of rotation, Kennedy's theorem; Velocity and acceleration polygons; Euler's first law; angular momentum and Euler's second law.

Kinetics of particles: Newton's second law of motion; Principles of work, energy, impulse and momentum; System of particles; Kinematics of rigid bodies; Kinetics of plane motion of rigid bodies: forces and acceleration; Principles of work and energy.

Text and Ref books:

1. Vector Mechanics for Engineers: Statics and Dynamics – Ferdinand P. Beer, E Russell Jr. Johnstone; Mc Graw-Hill Companies, 5th edition 1988.
2. Engineering Mechanics - Timoshenko, D H Young, J V Rao
3. Engineering Mechanics – Andrew Pytel, Jaon Kiusaloas
4. Engineering Mechanics, Statics and Dynamics – Joseph F Shelley; Mc Graw-Hill, 1980.
5. Engineering's Mechanics - J.L. Merian & LG Kraige

AEAS 203: Fundamentals of Fluid Mechanics

3.00 Contact Hour 3.00 Credit Hour

Fundamental concept of fluid, Properties of fluid, Fluid statics; manometers, hydrostatic forces on submerged surfaces, buoyancy and stability, Fluids in rigid body motion

Fluid kinematics, Lagrangian and Eulerian descriptions of fluid flow, Reynolds transport theorem, Continuity, Momentum, Energy and Bernoulli's equations and their applications
Dimensional analysis and similitude, dimensional homogeneity, Experimental testing and modeling

Introduction to two dimensional incompressible flows, boundary layer, laminar and turbulent flows, losses in pipes, minor losses in pipe fittings, pressure, velocity and flow measurements.

Text and Ref books:

1. Mechanics of Fluids - Irving H. Shames
2. Fluid Mechanics - Frank M. White
3. Fluid Mechanics - Yunus A. Cengel & John M. Cimbala
4. Fluid Mechanics - E. John Finnemore & Joseph B. Franzini

AEAS 205: Mechanics of Solids

3.00 Contact Hour 3.00 Credit Hour

Stress analysis: Stress-strain concept and their inter-relationship, axially loaded member, thermal and centrifugal stresses; Stresses in thin and thick walled cylinders and spheres.

Beams: Forces under different loading conditions and its effect on the resisting member; Shear force and bending moment diagrams; Various types of stresses i.e., bending, torsion, shear etc. in beams; Flexure formula; Deflection analysis of beams: integration and area moment methods; Introduction to reinforced concrete beams and slabs.

Torsion formula; Angle of twist; Modulus of rupture; Helical springs; Combined stresses: principal stress, Mohr's Circle; Columns: Euler's formula, intermediate column formulas, the Secant formula; Flexure formula of curved beams; Problem-based applications in aerospace, mechanical and biomedical engineering.

Introduction to experimental stress analysis techniques; Strain energy; Failure theories.

Text and Ref books:

1. Strength of Materials – James M. Gere & Barry Goodno.
2. Strength of Materials (4^{th} edition) – Andrew Pytel, Ferdinand L. Singer.
3. Strength of materials (4^{th} edition) -William Nash; Mcgraw-hill International Editions, Schaum's Outline Series.
4. Strength of Materials – Beer and John Stone.

AEAS 206: Mechanics of Solids Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on AEAS 205
Experiments cover basic concepts of mechanics, structures and materials science; Selected experiments on Kater's Pendulum, equilibrium of forces and moments, tension and torsional test of different materials and deflection of thin-walled members, bending of beams under flexural loads.

AEAS 207: Thermodynamics

3.00 Contact Hour 3.00 Credit Hour

Fundamental concepts and first law: Concept of continuum, macroscopic approach, thermodynamic systems; closed, open and isolated. Property, state, path and process, quasi-static process, work, modes of work, Zeroth law of thermodynamics- concept of temperature and heat, internal energy, specific heat capacities, enthalpy - concept of ideal and real gases. First law of thermodynamics - applications to closed and open systems - steady flow processes.

Second law and entropy: Second law of thermodynamics; kelvin planck and clausius statements of second law. Reversibility and irreversibility - carnot theorem, carnot cycle

using steam, reversed Carnot cycle, efficiency, COP - thermodynamic temperature scale - clausius inequality, concept of entropy, entropy of ideal gas, principle of increase of entropy.

Thermodynamic availability: Basics; energy in non-flow processes: expressions for the energy of a closed system – equivalence between mechanical energy forms and exergy – flow of energy associated with heat flow – exergy, consumption and entropy generation - exergy in steady flow processes: expressions for exergy in steady flow processes – exergy dissipation and entropy generation.

Properties of pure substance: Properties of pure substances ; thermodynamic properties of pure substances in solid, liquid and vapour phases, Use of property tables, phase rule, PVT surfaces, standard rankine cycle.

Air standard and Refrigeration cycles: Equations of state for ideal gases, Properties of gases and vapours; Properties of atmospheric air; Non-flow and flow processes; air standard cycles; Brayton, Otto and Diesel cycles. Refrigeration cycles; phase change of working substance. Thermodynamic relations and equations of state; Mass and energy balance for a combustion reaction; Mixtures of gases and vapours; Fuels and combustion.

Text and Ref books:

1. Thermodynamics – Yunus A. Cengel, Michael A. Boles
2. Fundamentals of Thermodynamics – R E Sonntag, C. Borgnakke, G J. Van Wylen; John Wiley & Sons, Inc, 5th edition, 2000.
3. Thermodynamics - Kenneth Wark, 6th Ed; McGraw-Hill, Singapore, 1999.

AEAS 208: Thermodynamics Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAS 207.

AEAS 210: Aeronautical Engineering Drawing-II

3.00 Contact Hour 1.50 Credit Hour

Introduction, Using the Interface, Basic Functionality, The 40-Minute Running Start, Assembly Basics, Solid Works Toolbox Basics, Drawing Basics, Solid Works Drawings Basics, Design Tables, Revolve and Sweep Features, Loft Features, Visualization, Solid Works Simulation Xpress

Text and Ref books:

As referred by the subject teacher.

AEAS 215: Aircraft Systems

3.00 Contact Hour 3.00 Credit Hour

Aircraft systems: Hydraulic systems; Study of typical workable systems, components, hydraulic systems controllers, modes of operation, Pneumatic systems, working principles – typical pneumatic power system, brake system, components, anti-skidding, landing gear systems, classifications, shock absorbers.

Airplane control systems: Conventional Systems, power assisted and fully powered flight controls, power actuated systems, engine control systems, push pull rod system, operating principles, modern control systems, digital fly by wire systems, auto pilot system, active control technology

Engine systems: Fuel systems, piston and jet engine systems, multi-engine fuel systems, fuel quality measurement, Fuel system operating modes, fuel tank safety. Engine lubricating systems; piston and jet engines, starting and ignition systems, engine accessories, thrust vectoring systems, Engine control and health monitoring systems

Air conditioning and pressurizing system: Basic air cycle systems, vapour cycle systems, boot-strap air cycle system, evaporative vapor cycle systems, evaporation air cycle systems. Oxygen systems, fire protection systems, deicing and anti-icing system.

Electrical Systems : Aircraft electrical systems, Power generation, Primary power distribution, Power conversion and energy storage, Secondary Power Distribution, Typical aircraft DC systems, Typical civil transport electrical systems, Electrical Loads, Emergency power generation, Recent electrical system development.

Avionics Systems: Avionics systems, aircraft instrumentation, Flight data recording system, cockpit voice recording system, Warning Systems, Fire detection and suppression, Emergency power sources, Explosion suppression, Emergency oxygen, Passenger evacuation, Emergency landing.

Text and Ref books:

1. Aircraft Power Plants- Mekinley, J.L. and R.D. Bent; McGraw Hill 1993.
2. Aircraft Systems (3rd edition) -- Ian Moir, Allan Seabridge; WILEY Publications.
3. Aircraft Fuel Systems—Roy Langton, Chuck Clark, Martin Hewitt, Lonnie Richards; WILEY Publications.
4. Gas Turbine Technology- Treager, S.; McGraw Hill.
5. Aircraft Maintenance & Repair- Mckinley, J.L. and Bent R.D; McGraw Hill.
6. Handbooks of Airframe and Power plant Mechanics; US dept. of Transportation, Federal, Aviation Administration, The English Book Store, New Delhi, 1995
7. Aircraft Instruments & Principles- Pallet, E.H.J; Pitman & Co 1993.

AE 300: Industrial Training

04 Weeks 1.00 Credit Hour

Intensive industrial training to home / abroad prescribed by the department.

NOTE: It will be conducted after the completion of Level-3, at any convenient time as can be arranged by the Department

AEAS 301: Heat Transfer

3.00 Contact Hour 3.00 Credit Hour

Basic modes of heat transfer; General conduction equations; Steady state conduction in different geometrics and composite structures; Effect of variable thermal conductivity; Heat transfer from extended surfaces.

Mechanism of convective heat transfer; General methods for estimation of convective heat transfer coefficient; Heat and momentum transfer associated with laminar and turbulent flow of fluids in forced convection; Free convection from exterior surfaces of common geometrics.

Mechanism and laws of radiation heat transfer; Blackbody and gray body emission; Radiative properties of surfaces.

Boiling and condensation; pool boiling, forced convection boiling, film condensation, drop-wise condensation, condensation number

Heat exchanger: basic types, LMTD, exchanger effectiveness-NTU relations; Techniques of heat transfer augmentation; Heat exchanger devices.

Text and Ref books:

1. Heat Transfer - J. P. Holman
2. Heat & Mass Transfer - Yunus A. Cengel & Afshin J. Ghajar
3. Principles of Heat Transfer - F. Kreith, Mark S. Bohn
4. Heat Transfer - Binay K. Dutta
5. Heat Transfer – A basic approach by M. Necati Ozisik

AEAS 322: Heat Transfer Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on AEAS 301

AEAS 303: Applied Aerodynamics and Computational Fluid Dynamics (CFD)

4.00 Contact Hour 4.00 Credit Hour

Boundary Layer theory; Boundary Layer equations for laminar flow; Vonkarman Integral Momentum equation and skin friction, skin friction drag, potential flow; elementary flows, their combination and applications, Hydraulic Machines

Aerofoil characteristics, aerofoil shapes and thin airfoil theory; Definitions of Aerofoil; Pressure distribution over aerofoil; Centre of pressure and its movement; Lift, drag and Pitching movement of an aerofoil; Joukowski transformation theory.

Wing characteristics; Prandtl's lifting line theory; Different types of drags; Effects of downwash and limiting effects such as stall and surge.

Introduction to finite difference and finite volume methods; Basic concept of discretization, consistency and stability; finite element techniques for various types of problems related to aerospace structures and finite element analysis program; applications of numerical methods to selected models.

Text and Ref books:

1. Mechanics of Fluids - Irving H. Shames
2. Mechanics of Fluids - B. S. Messy
3. Fundamentals of Aerodynamics - John D Anderson; McGrawhill.
4. Aerodynamics for Engineering Students - T.H.G. Megson; Elsevier.
5. Computational Fluid Mechanics and Heat Transfer - Anderson.

AEAS 324: Applied Aerodynamics and CFD Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on AEAS 303:
Experiments include topics of theory of flight, low speed aerodynamics, wind tunnel operations and flow visualization techniques; Pressure and velocity distribution along the radius of a forced vortex, coefficient of drag for a right circular cylinder, and lift and drag characteristics of NACA-0012 airfoil; Experiments in the open circuit subsonic wind tunnel, wind tunnel calibration, model testing and data reduction for obtaining important aerodynamic and stability parameters of an aircraft; Familiarization with the use of supersonic wind tunnel and its flow visualization system.

Text and Ref books:

1. Low Speed Wind Tunnel Testing - Pope and Harper; John Wiley, N.Y. 1966.
2. High Speed Wind Tunnel Testing - Pope and Harper; John Wiley.

AEAS 305: Aerospace Propulsion

4.00 Contact Hour 4.00 Credit Hour

Fundamentals of air breathing engines; Operating principles of piston engines, thermal efficiency calculations, classification of piston engines, illustration of working of gas turbine engine, the thrust equation, factors affecting thrust, effect of pressure, velocity and temperature changes of air entering compressor. Propeller theory.

Inlets, nozzles and combustion chambers for jet engines; Internal flow and Stall in subsonic inlets – relation between minimum area ratio and eternal deceleration ratio, diffuser performance, supersonic inlets, shock swallowing by area variation, real flow in nozzles and nozzle efficiency, losses in nozzles, equilibrium flow and frozen flow in nozzles, two phase flow in nozzles, ejector and variable area nozzles, interaction of nozzle flow with adjacent surfaces, thrust reversal, classification of combustion chambers, combustion chamber performance, flame stabilization.

Propulsion unit requirements for subsonic and supersonic flight. Compressors, combustion systems, turbines and after burner. Gas turbine cycles for aircraft propulsion; turbojet, turbofan, turbo shaft engines. Efficiency of components; Off-design considerations; Selection of materials for aero-engine. Aero-thermochemistry of Fuels and Propellants. Methods of thrust augmentation, Aero engine control.

Rocket propulsion and rocket propellants; liquid and solid rocket propulsion systems, nozzle design, rocket performance; Dynamics of rocket flight, orbital velocity; Staging; Future developments; Minimization of noise and pollution; Sub-orbital propulsion systems; Ram jet; Scram-jets; Hybrid engines.

Text and Ref Books:

1. Mechanics and thermodynamics of propulsion - Hill and Peterson, 2nd edition Addison; Wesley, NY, 1992.
2. Gas Turbine Theory-H Cohen, GFC Rogers, HIH Saravanamuttoo
3. Rocket propulsion elements (6th edition) - George P Sutton, Oscar Biblarz, John; Wiley, NY, 1992.
4. Aero thermodynamics of Aircraft Engine Components- Oates, G.C.; AIAA Education Series
5. Aircraft Gas Turbine Engine Technology (3rd edition) - Treager.
6. The Jet Engine - Rolls Royce Limited.

AEAS 306: Aero-space Propulsion Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAS 305

AEAS 307: Aircraft Loading and Structural Analysis

3.00 Contact Hour 3.00 Credit Hour

Fundamental equations of elasticity and their applications, stress and deformation in elemental structures/components; General equations and solution techniques; Energy methods in structural analysis: Principles of virtual work and total potential and complimentary energies.

Bending of beams with unsymmetrical cross-sections; Basic principles and theory of stressed-skin structural analysis; Determination of direct stresses and shear flows in arbitrary thin-walled beams: unsymmetrical sections, open and closed sections, tapered sections, continuous and idealized sections.

Fundamental theory of plates, including in-plane and bending loads as well as buckling and shear instabilities; Solution techniques for plate problems including Navier's solutions for rectangular plates; Energy methods for plate bending and plate buckling.
Analysis of common aircraft components including fuselages, wings, skin-panels, spar, stringers, ribs, frames and longerons.

Text and Ref books:

1. Aircraft Structures for Engineering Students- T.H.G Megson
2. Aircraft Structure –David & Perez; Publisher – McGraw-Hill.
3. Strength of Materials (4^{th} edition) – Andrew Pytel, Ferdinand L. Singer.
4. Strength of Materials –Beer and Johnston.

AEAS 313: High Speed Aerodynamics

3.00 Contact Hour 3.00 Credit Hour

Basic equations of compressible flow, wave propagation in compressible media; velocity of sound, subsonic and supersonic flows, Mach number, isentropic flow, stagnation properties, flow through convergent-divergent nozzle,

Normal shock waves, oblique shock and expansion waves, Prandatl-Mayer expansion fans, shock expansion theory, linearized flow theory,

Flow with friction and heat transfer, moving shock wave, shock tube flow, transonic flow, and measurements in compressible flow

Text and Ref books:

1. Fundamentals of Aerodynamics- John D. Anderson; McGraw Hill.
2. Aerodynamics for Engineering Students, 5^{th} Edition-E. L. Houghton & P. W. Carpenter
3. Gas Dynamics, 3^{rd} Edition-James E. A. John and Theo G. Keith
4. Gas Dynamics- E. Rathakrishna

AEAS 315: Aerospace Vehicle Stability and Control

3.00 Contact Hour 3.00 Credit Hour

Importance and significance of flight stability and control - Static Longitudinal, Directional and Lateral stability with respect to the aircraft axis systems; Effect of various wings design and secondary control surfaces; Origin of symmetric forces and moments; Static and maneuvering longitudinal stability, equilibrium and control of rigid aircraft; Effects of various major components on Static Stability, Critical flight conditions and controls requirement.

Dynamic Stability - the Axes Systems (Inertial, Body and Stability axes) and their Transformations; Treatment of Aircraft Equations of motion / linearization; Aerodynamic load effects of wings, stabilizers, fuselages and power plants; Trailing edge aerodynamic controls; Trimmed equilibrium condition; Static margin; Effect on static stability of free and reversible controls.

Space related topics i.e. Equation of motions, static stability and control, longitudinal and lateral dynamics, Stability Derivatives.

Text and Ref books:

1. Aircraft Performance Stability and Control, Vol-I, - James D; Lang United States Air force Academy.
2. Automatic Control of Aircraft and Missiles - Col. John H, Blakelock
3. Airplane Performance, Stability and Control - Perkins and Hage
4. Dynamics of Flight - Bernard Ethin

AEAS 317: Mechanics of Structure, Structural Vibration and Aero Elasticity

4.00 Contact Hour 4.00 Credit Hour

Mechanisms; Displacement, velocity and acceleration; Turning moment: inertia and kinetic energy of reciprocating and rotating parts; Study of gears and gears trains; Static and dynamic balancing: reciprocating and rotating parts, multi-cylinder in-line and radial engines, V-engines and opposed-piston engines; Balancing machines; Principles and applications to orbital and gyroscopic motion.

Free vibrations with one and two degrees of freedom; Longitudinal, transverse and torsional vibrations; Damped free and forced vibrations with single degrees of freedom; Whirling of shafts and rotors; Vibration absorption and isolation; Vibration measuring instruments; Methods of determining natural frequencies: matrix methods; Continuous systems: lateral vibrations of beams; Introduction to Lagrangian methods.

Introduction to aero elasticity, load distribution, concepts of divergence, control effectiveness and reversal.

Text and Ref books:

1. Theory of Machines (S. I. Units) – R. S. Khurmi, J. K. Gupta; Eurasia Publishing House (Pvt.) Ltd.

2. Mechanical Vibration-Theory and Applications (2nd Edition) - Frances S Tse, Ivan E Morse and R T Hinkle
3. Theory of Vibration with Application - William T Thomson

AEAS 319: Machine Design

3.00 Contact Hour 3.00 Credit Hour

Introduction to machine design. Design of basic machine elements like power screws, shaft and hole systems, keys and couplings, rivets, springs, bearings, gears, brakes and clutches. Design with composite materials.

Text and Ref books:

1. A Textbook of Machine Design - R. S. Khurmi, J. K. Gupta
2. Fundamentals of Machine Component Design - Robert C Juvinall.
3. Design of Machine Elements (4th Ed) - Virgil Moring Faires
4. Mechanical Engineering Design (7th Edition) - Joseph E Shigley, Charles R Mischke & Richard G Budynas

AEAS 320: Machine Design Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on AEAS 319.

AEAS 331: Materials Science and Aerospace Materials

3.00 Contact Hour 3.00 Credit Hour

Elements of aerospace materials; Structure of solid materials, Atomic structure of materials, crystal structure, miller indices, density, packing factor, space lattices, imperfection in crystals, physical metallurgy, Phase diagram including the Fe-FeC3 equilibrium diagram, general requirements of materials for aerospace applications.

Mechanical behavior of materials; Linear and nonlinear elastic properties, Yielding, strain hardening, fracture, Bauchinger's effect –Notch effect testing and flaw detection of materials and components, creep and fatigue -Comparative study of metals, ceramics plastics and composites. Introduction to destructive and non-destructive tests.

Corrosion & heat treatment of metals and alloys; Types of corrosion, effect of corrosion on mechanical properties, stress corrosion cracking, Corrosion resistant materials used for space vehicles, heat treatment of carbon steels, aluminum alloys, magnesium alloys and titanium alloys, effect of alloying treatment, heat resistance alloys, tool and die steels, magnetic alloys.

Introduction to powder metallurgy, modern ceramic materials, cermets, glass ceramic, plastics and rubber, carbon/carbon composites, fabrication processes involved in metal matrix composites, shape memory alloys, applications in aerospace vehicle design, Basic concepts of Nano-science and Nanotechnology.

High temperature materials: Characterization; classification, production and characteristics, methods and testing, determination of mechanical and thermal properties of materials at elevated temperatures, super alloys, high temperature material applications.

Text and Ref books:

1. Aircraft Materials and Processes- Titterton.G.; Pitman Publishing Co.
2. Introduction to Physical Metallurgy (2^{nd} edition) -Sidney H Avner; Tata McGraw – Hill Edition.
3. Engineering Materials, Their properties and Applications- Martin, J.W.; Wykedham Publications (London) Ltd.
4. Composite Materials for Aircraft Structures (2nd edition)- Allan Baker, Stuart Dutton, Donald Kelly; AIAA Education Series
5. Engineering Metallurgy (Part I & II) (6^{th} edition) – Raymond A. Huggins; Viva Books Private Ltd.
6. Materials Science and Engineering: An Introduction – W D Callister, Jr.; John Wiley and Sons, Inc (4^{th} edition) 1997
7. A Text Book of Nano-science and Nanotechnology- T.Pradeep; Tata McGraw Hill,

AEAS 332: Materials Science and Aerospace Materials Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based AEAS 331.

AEAS 400: Project and Thesis

6.00 + 6.00 Contact Hour 3.00 + 3.00 Credit Hour

In this course, students are required to undertake a major project in engineering analysis, design and development of research related to Aerospace Engineering. The objective is to provide an opportunity to develop initiative, self-reliance, creative ability and engineering judgment. The results must be submitted in a comprehensive report with appropriate drawings, charts, bibliography, etc. along with products if any. Use of locally available materials in manufacturing and feasibility study of local industrial units will be emphasized.

AEAS 401: Computational Structural Analysis

3.00 Contact Hour 3.00 Credit Hour

Standard analytical and computational techniques for evaluating stresses, strains, deformations and strengths of representative aerospace structural elements, such as bars, beams/frames, plates/shells; Variational and Residual methods in structural analysis; Finite difference method.

Finite Element Methods in stress analysis of structures; Concept of stiffness of a spring and formulate elemental stiffness matrix for different elements using direct and energy theorems; Load vector and displacement vectors; Methods to determine nodal displacements of structures by manual and computer package; Finite Element analysis of bars, plane pin-jointed trusses, beams, plane frames and panels.

Text and Ref books:

1. Finite Element Methods in Structural Mechanics - C T F Ros.
2. An Introduction to the Finite Element Method - J N Reddy, 2nd Ed; McGraw-Hill, NY, 1993.
3. Concepts and Application of Finite Element Analysis - Robert D Cook..
4. Finite Element Methods in Engineering Science - C T F Ross.

AEAS 407: Turbomachinery

3.00 Contact Hour 3.00 Credit Hour

Mechanics and thermodynamics of diffusers, nozzles, compressors and turbines; Dimensional Analysis, Energy Transfer in turbo-machines, Stage dynamics and performance of axial flow compressor and turbine, centrifugal compressors and radial turbines, stage velocity triangles. Theories of cascades. Axial compressor and turbine blade design considerations. Prediction of design and off design performance of Gas Turbines; Gas turbine component matching; Transient behavior of Gas turbines.

Text and Ref Books:

1. Mechanics and Thermodynamics of Propulsion - Hill & Peterson.
2. Fluid Mechanics, Thermodynamics of Turbo-machinery - S L Dixon; Pergamon Press, 1966.
3. Gas Turbine Theory-H Cohen, GFC Rogers, HIH Saravanamuttoo
3. Principles of Turbo-machinery - Seppo A. Korpela; WILEY Publications.
4. Aerothermodynamics of Turbo-machinery: Analysis and Design - Naixing Chen.
5. Turbines Compressors and Fans-S M Yahya.

AEAS 416: Wind Tunnel Testing Sessional

1.50 Contact Hour 0.75 Credit Hour

This course consists of a series of lectures on wind tunnel testing followed by experimental work on the MIST Subsonic Wind Tunnel. It includes wind tunnel calibration, model testing and data reduction for obtaining important aerodynamic and stability parameters of an aircraft. The necessary tunnel boundary corrections and scale effects are also evaluated and applied to the raw data. The experimentally obtained parameters are finally compared with those determined theoretically. A formal report is eventually submitted at the end of the course.

Text and Ref books:

1. Low Speed Wind Tunnel Testing - Pope & Harper
2. CAE Report AE/2/77
3. Methods of Estimating Stability and Control Derivatives of Conventional Subsonic Airplanes - Jan Roskam

AEAS 437: Aerospace Vehicle Design

3.00 Contact Hour 3.00 Credit Hour

Introduction to conceptual design; Design layout and design analysis - various types and categories of aircraft, requirement of teamwork for complex engineering projects.

Aircraft design methods; Techniques for selecting, sizing and stressing components; Regulatory requirements for certification; Off-design requirements; Construction tolerances.

Aircraft preliminary design; Configuration design - performance, propulsion, weight and balance; Aerodynamics design – lift, drag, stability and control, structures and loads; Structural design - payload considerations, centre of gravity requirements and materials; Philosophies of design and analysis.

Aircraft detailed design; System design –System design procedures; Systems integration; Test procedures; Fatigue and damage tolerance; the art of design and trade studies. Investigation of a typical aircraft configuration; Component layout; Alternate configurations; weight penalties or gains; requirements for ancillary equipment. Engine and propeller selection.

Text and Ref books:

1. Aircraft Design: A Conceptual Approach - Raymer, 3rd Ed; AIAA Virginia, 1999.
2. "Synthesis of Subsonic Airplane Design" (Delft UP) – Torenbeek.
3. Design of aircraft - Thomas C. Corke; Pearson Education.
4. Aircraft Performance and Design - John D. Anderson; WCB McGrawhill.

AEAS 438: Aerospace Vehicle Design Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAS 437.

AEAS 439: Rotordynamics and Aircraft Performance

3.00 Contact Hour 3.00 Credit Hour

Performance of Fixed-Wing Aircraft: Introduction, the aircraft and its environment, weight performance, Aerodynamic performance, Engine performance. Flight envelopes, take-off and landing, climb and gliding, cruise performance; Maneuver performance.

Rotary-Wing Aircraft Performance: Introduction to rotor dynamics, momentum theory, Vertical climb and descent, Autorotation, Ground effect, Rotor mechanisms, Introduction to rotor aerodynamics and aerodynamic design

Rotorcraft performance; rotorcraft in vertical and forward flight; rotorcraft manoeuvre; Rotorcraft mission analysis; V/STOL performance; Noise performance.

Text and Ref Books:

1. Performance of Fixed and Rotary Wing Aircraft - Antonio Filippone
2. Aerodynamics of the helicopter - Alfred Gessow/ Garry C. Myers Jr.
3. Basic Helicopter Aerodynamics - John Seddon/Simon Newman.
4. The Art of the Helicopter - John Watkinson.
5. Aircraft Performance and Design - John D. Anderson; WCB McGrawhill.

AEAS 445: Industrial and Business Management

3.00 Contact Hour 3.00 Credit Hour

Organization and management: system approach to organization, organization theory and organizing practices, basics of organizing.

Personnel and human resource management in business human factors and motivation, leadership, group decision making and communication, Job gradation, process of performance appraisal and reward systems

Emergence of management thought and the patterns of management analysis scientific management and Taylorism, Modern operational-management theory, emergence of the behavioural sciences, recent contributors to management thought.

Cost management elements of cost of products, cost centers and allocation of overhead costs; Management accounting: marginal costing, standard costing, cost planning and control, budget and budgetary control; Development and planning process; Annual development plan; National budget.

Financial management: objectives, strategy, financing, performance analysis of enterprises, investment appraisal, criteria of investment.

Marketing management: marketing concept, marketing organization; Industrial and consumer selling; Channel decisions; Advertising decisions; New product strategy.

Elements of production planning and control; Types of production system; Functions of production, planning and control with an overview of different types of manufacturing systems; Factors affiliated with different fields of production including product characteristics and economic analysis.

Forecasting methods and their application; Aggregate planning; Master production scheduling; MRP; Coding and standardization; Capacity planning; Inventory management - ABC analysis; Production scheduling techniques - CPM and PERT; Line balancing; Capacity planning.

Types of information systems and it’s benefits at different management levels; Computers in production planning and control; MRPII and JIT

Text and Ref books:

1. Management - Jams A. F. Stoner, R. Edward Freeman, Daniel R. Gilbert,
2. Management - Stephen P. Rubbins, Mar Conlter, Robin Stuart kotze.
3. Operation Management - Chase & Jacob.
4. Managerial Accounting - Garrison, Noreen.
5. Product Design & Development - Ulrich & Eppinger
6. Product Design Methods & Practices - Henry W Stoll
7. Developing New Products with TQM - Charles Gevirtz

AEAS 447: Space Engineering

3.00 Contact Hour 3.00 Credit Hour

Introduction: Space environment, types of spacecraft, present-day satellites and launch vehicles.

Orbital mechanics: Two-body Problem, Kepler's laws, geometry of orbits, Kepler's equation, classical orbital elements, orbit determination from initial conditions, position and velocity prediction from orbital elements.

Satellite operations: Geostationary orbit, Hohmann transfer, inclination change maneuvers, launch windows for rendezvous missions, perturbation effects due to earth oblateness, sun synchronous orbits.

Attitude dynamics and control: Rotation matrices, Euler angles, attitude kinematics, Euler's equations for rotational dynamics, torque free motion of asymmetric and axisymmetric rigid bodies, effect of energy dissipation on stability of rotational motion, attitude control of spinning and non-spinning satellites.

Basic properties of the electro-magnetic environment in space; Basic Space Law and legislative issues; The Outer Space Treaty; The Space Activities Act Standards.

Introduction to rocket launching: Rocket equation, multi-staging, parallel staging, optimal staging, sensitivity ratios, vertical ascent trajectories, gravity turn trajectories.

Introduction to satellite system, Types of satellite, Satellite components. Satellite link design; uplink & downlink. Satellite constellation. Dilution of precision, Satellite Receivers: characteristics, error. Receiver Autonomous Integrity Monitoring.

Introduction to systems engineering approach.

Text and Ref books:

1. Elements of Spacecraft Design - Charles D. Brown
2. Satellite Technology Principles and Applications - Anil K. Maini and Varshaagrawal
3. Space Mission Analysis and Design - Wiley J. Larson and James R. Wertz
4. Spacecraft Systems Engineering- Peter Fortescue, John Stark and Graham Swinerd
5. Digital Satellite Communications - Tri T. Ha; McGraw-Hill International.

6. Satellite Communications- Dennis Roddy; McGraw-Hill TELECOM.
7. Satellite Communications - T. Pratt, C. Bostian, J. Allnut; John Wiley & Sons Inc.

Elective Courses (Aerospace Discipline)

AEAS 419: Maintenance Management and Repair of Aircraft

3.00 Contact Hour 3.00 Credit Hour

Maintenance management principles and techniques – maintenance strategies, repair/replacement decision making, condition monitoring, maintenance management information systems; damage assessment techniques; Types of aircraft maintenance; Maintenance requirements for various aircraft components; Aero-engine maintenance; Engine overhaul, component life, lubrication, patches and repairs, serviceability of components.

Logistics concepts, statistics of reliability, availability, maintainability, reparability, life-cycle costing, logistic support analysis and supply support factors.

Practical issues in maintenance and repair of structures and systems and details of maintenance scheduling activities; Advanced methods of maintenance and repair; Application of NDI for manufacture and maintenance of structural components in aircraft industry.

Different structural failure modes and analysis the causes of failure; Aircraft accident investigation and prevention.

Text and Ref books:

1. Aircraft Production Technology and Management - S C Keshu and KK Ganapathi; Interline Publishing.
2. Aircraft Maintenance and Repair – kroes; Watkins Delp, McGraw Hill.
3. Aircraft Construction, Repair and Inspection - JOE Christy; Sterling Book House.

AEAS 421: Aviation Safety

3.00 Contact Hour 3.00 Credit Hour

Safety in aviation including aircrew, aircraft, maintenance, management operations and airspace with an emphasis on human performance; Safety management programs.
Human factors in aviation, relationship between the safety and efficiency of an aviation system and the people, tasks, environment and technology - human behavior, information processing, time management and situational awareness; Judgment, decision making, the senses, human error, automation, risk management, and emergency planning.
Role of proactive safety systems – crew resource management, safety culture, operational reporting systems, safety audits, attitudinal and behavioral assessment and other metrics.
Illustrate safety concepts, accident prevention strategies, safety culture and safety program evaluation methodology; Practical analysis of aircraft incidents and accidents in flight safety.

Text and Ref books:

1. Hand notes provided - the teacher / instructor.
2. Flight safety Journal/ manuals from BAF.

AEAS 423: Aerospace Management

3.00 Contact Hour 3.00 Credit Hour

Introduction to aerospace management; Principles and practice of aviation, air traffic services and airline management incorporating flight mechanics and aircraft handling; Analysis of airline operations; Basic human factors and systematic safety issues involving aircraft accident case; Classification and use of civil and military airspace; Aspects of flight separation, aircraft performance and basic meteorology.

Civil aviation activities include engineering and maintenance, technical crew planning and scheduling; Airport and airfield planning for military and civil operations, operations control issues; Aviation regulations and safety; Flight safety and airworthiness standards; Risk and reliability management; Certification procedures and standards; Emergency procedure management and risk management, accident investigation and dispatch reliability management.

Text and Ref books:

1. Hand notes provided - the teacher / instructor.

AEAS 425: Pressurization and Air Conditioning Systems

3.00 Contact Hour 3.00 Credit Hour

Concept of pressurization and its applications in the cockpit; Study of pressurization system and different components related to cockpit pressurization.

Concept of refrigeration and its applications; Different refrigeration methods; Analysis of vapor compression refrigeration, absorption refrigeration and air-cycle refrigeration systems; Refrigerants; Refrigeration equipment: compressors, condensers, evaporators, expansion devices, other control and safety devices; Multi-evaporator, multi-compressor systems; Low temperature refrigeration.

Concept of air conditioning and its uses; Cooling load calculation; Psychometric analysis; Air conditioning systems; Air distribution systems; Duct design methods; Air conditioning equipment; Application criteria; Control systems.

Fire hazard and firefighting equipment.

Text and Ref books:

1. Modern Refrigeration and Air-conditioning – A D. Althause, C. H. Turnquist, A.F. Bracciano; The Goodheant Wilcox Company, Inc. 1982.
2. Heating cooling of Building, Design for Efficiency – J. F. Kreidev, A. Raldl; McGraw-Hill International Edition, 1994.

AEAS 427: Noise Control and Vibration

3.00 Contact Hour 3.00 Credit Hour

Sound waves; Sound sources; Sound transmission through walls and structures; sound pressure level; psychological response to sound; threshold of hearing and threshold of pain, maximum permissible levels of sound exposure; Sound transmission inside the aircraft; Mechanism of sound absorption; Sound control inside the aircraft.

Physical acoustics: The wave equation, solution of the wave equation, comparison with vibration having finite degrees of freedom; Acoustics of large and small rooms; Mechanism of sound absorption; Design of silencers.

Noise attenuation and control; Statistical properties of noise; response of systems to noise, correlation functions and transfer; Frequency response functions.

Vibration isolation, machine foundation design; Generation of vibration in machines, acceptable levels and methods of control; Vibration absorption; Random vibration; Beam and plate vibrations; Radiation of sound from vibrating machinery.

Importance of vibration in aircraft and helicopters; Vibration identification and preventive measures in aircraft and helicopters.

Text and Ref books:

1. Fundamentals of Noise and Vibration – F. J. Fahy, J. G. Walker; Spon Press; 1998.
2. Active control of Noise and Vibration – Colin Snyder Hansen – C. H. Hansen, Scott Snyder; Spon Press, 1st edition, 1996.
3. Mechanical Vibrations (3rd edition) - Singiresu S Rao; Addison-Wesley, Massachusetts, 1995

AEAS 429: Rotorcraft Performance

3.00 Contact Hour 3.00 Credit Hour

Examine the performance of rotorcraft in hover, forward and climbing flight; Methods for estimating the performance of rotors and engines in the presence of a helicopter fuselage and other rotors; Calculate the control settings and actuator forces for trim in hover, forward and climbing flight at various centre of gravity locations for a real helicopter.

Helicopter dynamics and proceeds to derive stability augmentation and flight control system design; Rotorcraft flight test engineering including the use of dimensional analysis; Design regulations and considerations relating to rotor induced vibration, ground resonance and fatigue; Emphasis on design for crash worthiness; Fail safe and safe life concepts.

Text and Ref books:

1. Rotary Wing aerodynamics - W.Z. Stepniewski and C.N. Keys; Dover Publications.
2. Theory of Flight (AP 3456A) - Royal Air Force Manual.
3. Helicopter Flight Dynamics - Gareth D. Padfield.

AEAS 431: Weapons Engineering

3.00 Contact Hour 3.00 Credit Hour

History of explosives; Types and properties of explosives; Initiation systems, quantity distance procedures; Effect of blast, fragmentation and shaped charge warheads; Quarry blasting and explosive demolition; Blast waves and interactions, blast loads on structures, blast analysis and structural design; Survivability of structures.

Kinetic energy of penetrations; Propellant charges; Fuses, initiators, detonators and safe / arm devices; Dynamics of unguided weapons: fin and spin stabilization.

Principles of missile flight and propulsion; Aerodynamics and dynamics of slender bodies and wings; Spin and fin stabilization of projectiles, trajectories and maneuver capabilities; Layout, control, propulsion and their integration with other systems; Storage, maintenance, transport and launch considerations. Missile guidance techniques; Physics and accuracy of missile sensors and effect on guidance; Advanced guidance and sensor systems; Prediction techniques for missile aerodynamics; Introduction to Electronic warfare

Discussion on present and future trends in weapon technologies.

Text and Ref books:

1. Hand notes provided - the teacher / instructor.

AEAS 435: Aircraft Structural Design

3.00 Contact Hour 3.00 Credit Hour

Introduction to Aircraft Structural Design;

Design for Manufacturing: Engineer's Responsibility, Producibility, Maintainability, Tooling, Other Considerations

Aircraft Loads: Review of Aero-elasticity, Flight Maneuvers, Wing Design Loads, Empennage Loads, Fuselage Loads, Propulsion Loads, Landing Gear Loads, Miscellaneous Loads, and Example of an Airplane Load Calculation

Buckling and Stability of Structures: Columns and Beam Columns, Crippling Stress, Buckling of Thin Sheets, Thin Skin-Stringer Panel – Compression, Skin-Stringer Panel – General, Integrally Stiffened Panel,

Wing Design: Wing Box Structure, Wing Box Design, Wing Covers, Spars, Ribs and Bulkheads, Wing Root Joints, Variable Swept Wings, Wing Fuel Tank Design, Wing Leading and Trailing Edges, Wing Control Surfaces, Fixed Leading and Trailing Edges, Design Considerations

Empennage Design: Horizontal Stabilizer, Vertical Stabilizer (Fin), Elevator and Rudder

Fuselage Design: Introduction, Fuselage Configuration, Fuselage Detail Design, Forward Fuselage, Wing and Fuselage Intersection, Stabilizer and Aft Fuselage Intersection, Fuselage Opening

Landing Gear: Introduction, Development and Arrangements, Stowage and Retraction, Selection of Shock Absorbers, Wheels and Brakes

Engine Mounts: Propeller-Driven Engine Mounts, Inlet of Jet Engine (Fighter), Wing-Pod (Pylon) Mounts, Rear Fuselage Mount and Tail Mount, Fuselage Mount (for Fighters)

Text and Ref books:

1. Design of Aircraft by Thomas C. Corke; Pearson Education.
2. Synthesis of Subsonic Airplane Design (Delft UP) – Torenbeek.
3. Airframe Structural Design: Practical Design Information and Data on Aircraft Structures-Michael Chun-Yung Niu

AEAS 455: Human Performance and Limitations

3.00 Contact Hour 3.00 Credit Hour

Fundamental Human Factors Concept: Understand the term human factor, The need take human factors into account, incidents attributable to human factors/human error, human factors applications in aviation operations.
Human performance and limitation: Vision, Hearing, Information and protection, memory, claustrophobia and physical access.
Social Psychology & Responsibilities: Individual and group, motivation and de-motivation, peer pressure, culture issues, team working, management, supervision and leadership.
Factors affecting performance: Fitness/health, Stress: domestic and works related, time pressure and deadline, workload, overload, sleep and fatigue, shift work, alcohol, medication, drug use, use of psychoactive, substances, restriction on exercising privileges of license/ authorization under influence psychoactive substance(reference ANO D.3)
Physical Environment, Management and Organization: Noise and fumes, illumination, climate and temperature, motion and vibration, working environment, management's contribution to safety, allocation of resources, safe and unsafe organization.
Takes: physical work, repetitive tasks, visual inspection, complex systems.
Communication: Within and between teams, work logging and recording, keeping up to date currency, dissemination of information, terms and organizational issues in aircraft maintenance.

Human Error: Error models including the SHEL and Reason models, and theories, Murphy's law, human error in aircraft maintenance inspection including selected case studies, implications of error, error prevention considerations and strategies, avoiding and managing errors.
Hazards in workplace: Recognizing and avoiding hazards, dealing with emergencies.

Text and Ref books:

1. Human Factors for Aviation Maintenance - An EASA Part 66/147 approved manual on Human Factors; Aircraft Technical Book Co.
2. Human Performance and Limitations - Trevor Thom
3. Human Performance and Limitations in Aviation – R. D. Campbell, Michael Bagshaw

AEAS 457: Airworthiness Legislation

3.00 Contact Hour 3.00 Credit Hour

Aircraft Maintenance Engineers License: Civil Aviation Rules 1984 PART I, Air Navigation Orders & Sections, Responsibilities: by the need to fly aircraft in a satisfactory condition i. e. Common, civil, constitutional law, Penalties under statutory law and resulting from civil law suits, Categories - which parts of the aircraft, Area and extent of limitations and privileges within Categories, Overlap of Category applicability, Relevant Airworthiness Notices (e.g.5,11and 36)

Certifications: Civil Aviation Rules 1984 PART VIM, Certificate of Compliance: Maintenance Release; Fitness for Fight; Duplicate inspections, Contributory certifications and reliance on.

Aircraft Log Books: Civil Aviation Rules 1984 PART Vlll, CAAB Approval: Light Aircraft, large aircraft, Worksheets: Aircraft Maintenance Log, Data to be entered in log books, Condition reports; e.g., investigations, NDT and other inspections, Maintenance checks and inspections, Cross-reference to other files, records of other documentation and persons.

Aircraft Maintenance Log: Aircraft Maintenance Log - Air Operator's Certificate requirements.

Aircraft Maintenance: Type Certification, Weight Schedule, External and Internal Markings and Signs, National and Registration, Cabin Warning Placards, Doors and Exits. Certificate of Airworthiness Categories, Purposes of Flight, Flight Manual, Certificate of Registration, Air Operators Certificates, Radio Station License and Approval, Change of ownership, Maintenance Organization, Maintenance Schedule, General Engineering Manual, Stores Systems, Release of Parts, Civil Aviation Rules: 1984 part VIII, Reportable Defects, Reportable Accidents, Air Navigation Orders: Maintenance Requirements, Airworthiness Notice, Airworthiness Directives: Bangladesh and Foreign.

Text and Ref books:

1. ANO(Air Navigation Order)

2. CAR(Civil Aviation Rules) 1984

AEAS 459: Entrepreneurship Development

3.00 Contact Hour 3.00 Credit Hour

Entrepreneurship: definition and importance and its role; Characteristics and skills of entrepreneurs; Entrepreneurial process; Self-assessment; Managers, leader, innovators and entrepreneurs.

Small Business: nature and importance, methods for generating ideas, creativity process, product planning and development process; Merger, acquisition & joint venture; Business plan; Marketing plan; Market research; Financial plan; Organizational and human resource plan; Production plan; Financing the business, Managing early operations and growth.

Text and Ref books:

1. Entrepreneurship 6th Edition; Robert D. Hisrich, Michael P Peters, Dean AShepherd.
2. Entrepreneurship Strategies and Resources 3rd Edition; Marc J. Dollinger –Pearson Education.
3. New Venture Creation: Entrepreneurship for the 21st Century 5th Edition;Jeffrey A. Timmons – McGraw Hill.

AEAS 461: Advanced Materials Processing Technologies

3.00 Contact Hour 3.00 Credit Hour

Overview of Advanced Materials Processing Technologies: Outline of advanced materials processing techniques: Precision Materials Removal Processes; Precision Forming; Microwave Technology; Advanced Surface Engineering Processes; Joining Technologies.

Precision Removal Processes:Ultra-precision machining, theories, principles and applications. Micro Electro-discharge machining. Physio-chemical machining, Surface Metrology of machined components.

Laser Materials Processing: Fundamentals of industrial lasers. Laser materials interaction theories. Laser processing for various industries such as metals, non-metals, photovoltaic, bio-medical applications.

Nontraditional Machining: Principles, equipment, process variables and applications – surface engineering – concept of CIM and FMS – additive manufacturing – advanced manufacturing techniques.

Text and Ref books:

1. Aerospace Materials Handbook- Editors: Sam Zhang, Dongliang Zhao
2. Manufacturing Technology for Aerospace Structural Materials- F.C. Campbell; Elsevier
3. Aerospace Materials- Brian Cantor

AEAS 463: Fluid Power and Control

3.00 Contact Hour 3.00 Credit Hour

Introduction to Fluid Power, properties of Hydraulic Fluids, Energy, Power and Frictional losses in Hydraulic Systems, Pumps, Valves, Hydraulic Conductors and Fittings,

Ancillary Hydraulic Devices, Hydraulic Circuit Design and Analysis.

Introduction to pneumatics, Pneumatic logic control, Pneumatic Circuits and Applications, Basic Electrical Controls for Fluid Power Circuits.
Compressors, Air preparation, Valves and actuators

Text Books:

1. Fluid Power - Anthony Esposito; Prentice-Hall
2. Fluid Power - James A. Sullivan; Prentice-Hall
3. Control of Fluid Power by D. Mecloyt, H.R. Martin- Ellis Horwood; a division of John Wiley & Sons

Courses offered by Aerospace Engg. discipline to Avionics students

AEAS 433: Aerospace Technology

3.00 Contact Hour 3.00 Credit Hour

Types of aero-engines and allied systems; Reciprocating engine components and operation; Air-breathing aircraft engines including turbojet, turbo-prop, turbo-fan, hybrid, rocket, ramjet engines. Intake, compressor, combustion chamber, turbine, jet pipe, nozzle and after burner.
Metallurgy of aero-engine components, Properties of different aviation fuels and hydraulics.
Different systems of aircraft; Engine handling under different phases including start up, taxiing, take-off, climb, descent and landing.
Introduction to Hydraulic, pneumatic, oxygen system. Brake system, aircraft and engine control kinematic linkages.
Cabin pressurization and air conditioning.
Emergency systems, safety equipment, fire fighting system.

Text and Ref books:

1. Airframe & Power plant Mechanics (Power plant handbook) - U.S. Department of Transportation, Federal Aviation Administration.
2. Rolls Royce by Jet Engine

3. Mechanics and thermodynamics of propulsion- Hill and Peterson, 2nd Edition
4. Aircraft Gas Turbine Engine Technology (3rd edition) - Treager.
5. Rocket propulsion elements (6th edition) - George P Sutton, Oscar Biblarz; John Wiley, NY, 1992.

AEAS 434: Aerospace Technology Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional will be based on AEAS-433

Core and Specialized Courses Offered by Avionics discipline

AEAV 101: Electrical Circuit Analysis I

3.00 Contact Hour 3.00 Credit Hour

Circuit variables and elements: Voltage, current, power, energy, independent and dependent sources, resistance. Basic laws: Ohm's law, Kirchoff's current and voltage laws. Simple resistive circuits: Series and parallel circuits, voltage and current division, wye-delta transformation. Techniques of circuit analysis: Nodal and mesh analysis including supernode and supermesh. Network theorems: Source transformation, Thevenin's, Norton's and superposition theorems with applications in circuits having independent and dependent sources, maximum power transfer condition and reciprocity theorem. Energy storage elements: Inductors and capacitors, series parallel combination of inductors and capacitors. Responses of RL and RC circuits: Natural and step responses.

Magnetic quantities and variables: Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve. Laws in magnetic circuits: Ohm's law and Ampere's circuital law. Magnetic circuits: Series, parallel and series-parallel circuits.

Text and Ref books:

1. Alternating Current Circuits – Russel M Kerchner and George F Corcoran; John Wiley and Sons.
2. Introductory Circuit Analysis - R.L. Boylestad; Prentice Hall of India Private Ltd.
3. Introductory Circuits for Electrical & Computer Engineering - James. W. Nilson; Prentice Hall of India Private Ltd.

AEAV 102: Electrical Circuit Analysis I Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on AEAV 101.

AEAV 103: Computer Programming and Applications

3.00 Contact Hour 3.00 Credit Hour

Fundamentals of Computer: Basic concepts of computer organizations, CPU, Memory, I/O units such as hard disk, pen drives, CDROM/Writer, scanner, printers, keyboards etc. Number System Representation.

Introduction to programming languages: Evolution of programming languages, structured programming, the compilation process, object code, source code, executable code, operating systems, interpreters, linkers, loaders, fundamentals of algorithms, flow charts.

C Language Fundamentals: Character set, Identifiers, Keywords, Data Types, Constant and Variables, Statements, Expressions, Operators, Precedence of operators, Input-output Assignments, Control structures, Decision making and Branching, Decision making & looping.

C Functions: User defined and standard functions, Formal and Actual arguments, Functions category, function prototypes, parameter passing, Call-by-value, Call-by-reference, Recursion, and Storage Classes.

Arrays and Strings: One dimensional Array, Multidimensional Array declaration and their applications, String Manipulation.

Pointers: Pointer variable and its importance, Pointer Arithmetic, passing parameters by reference, pointer to pointer, linked list, pointers to functions, dynamic memory allocation.

Structures, Unions: Declaration of structures, declaration of unions, pointer to structure & unions.

File Handling: Console input output functions, Disk input output functions, Data files.

Text and Ref books:

1. C, The Complete Reference – Schildt, H; McGraw-Hill.
2. Turbo C/C++: The complete reference – Herber Schildt; Osborne Mc Graw-Hill
3. The Waite Group's C Programming using Turbo C++ – Robert Lafore; Sams Publishing.

AEAV 104: Computer Programming and Applications Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on AEAV 103.

AEAV 201: Electrical Circuits Analysis – II

3.00 Contact Hour 3.00 Credit Hour

Sinusoidal functions: Instantaneous current, voltage, power, Effective current and voltage, average power, Phasors and complex quantities, impedance, real and reactive power, power factor.
Analysis of single phase AC circuits: Series and parallel RL, RC and RLC circuits, nodal and mesh analysis, application of network theorems in AC circuits, circuits with non-sinusoidal excitations, transients in ac circuits, passive filters.
Resonance in AC circuits: Series and parallel resonance, magnetically coupled circuits.
Analysis of three phase circuits: Three phase supply, balanced and unbalanced circuits, power calculation.

Text and Ref books:

1. Alternating Current Circuits – Russell & George F. Corcoran; John Wiley and Sons.
2. Introductory Circuits for Electrical & Computer Engineering - James. W. Nilson; Prentice Hall of India Private Ltd.
3. A Text Book of Electrical Technology- B L Theraja and A K Theraja; S.Chand & Company Ltd.

AEAV 202: Electrical Circuits Analysis II Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAV 201.

AEAV 203: Electronics-I

3.00 Contact Hour 3.00 Credit Hour

Semiconductor diode, equivalent circuits; P-N junction as a circuit element: Intrinsic and extrinsic semiconductors, operational principle of p-n junction diode, contact potential, current-voltage characteristics of a diode; Diode circuits: Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a zener diode, zener shunt regulator, clamping and clipping circuits. Bipolar junction transistor (BJT): BJT characteristics and regions of operation, BJT as an amplifier. Single stage mid-band frequency BJT amplifier circuits: Voltage and current gain, input and output impedance of a common base, common emitter and common collector amplifier circuits.
Introduction to Metal-oxide-semiconductor field-effect-transistor (MOSFET) and Junction field-effect-transistor (JFET)
Operational amplifiers (Op-Amp): Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits, effects of finite open loop gain and bandwidth on circuit performance, logic signal operation of Op-Amp, dc imperfections.

Text and Ref books:

1. Microelectronic Circuits – Adel S. Sedra & Keneth C. Smith; Oxford University Press.
2. Electronic Devices and Circuit Theory - R.L Boylsted; Prentice Hall of India Private Ltd.
3. Semi Conductor Circuit Approximation - Albert P Malvino; Tata McGraw- Hill.
4. Electronic Devices and Circuits – Jacob Millman & Christos C. Halkias; Tata McGraw-Hill.
5. Micro-Electronic Circuit Analysis and Design- Donald A. Neamen; McGraw-Hill

AEAV 204: Electronics-I Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAV 203.

AEAV 205: Numerical Analysis and Applications

3.00 Contact Hour 3.00 Credit Hour

Roots of polynomials and transcendental equations; Determinants and matrices; Eigen values and eigen vectors; Solution of simultaneous linear equations; Solution of linear and non-linear algebraic equations; Solution of first-order differential equations; Introduction to the use of scalar, vector and matrix variables; The manipulation of matrix variables in arithmetic functions.
Interpolation methods; Numerical differentiation and integration; Solving equations by finite differences; Graph plotting and curve fitting; Applications in structural mechanics.
Iterative solutions for non-linear problems; Use fundamental programming concepts to solve mathematical problems; Develop computer programs to solve simple engineering and mathematical problems.
Engineering analysis by using graphical tools in MATLAB and MS Excel; Use of spreadsheet; Data structures; Graphing; Recursion; Packages for data manipulation.

Text and Ref books:

1. Numerical Methods – S. Balachandra Rao and C.K. Shantha; Stosius Inc.
2. Numerical Methods for Engineers – Steven C. Chopra, Raymond P. Carale; Tata McGraw-Hill Publishing Company Ltd.
3. Applied Numerical Analysis– Curtis F. Gerald, Patrick O. Wheatley; Addison-Wesley Publishing Company User's Guide for Student Edition of MATLAB – Duane Hanselman & Bruce Littlefield, Prentice Hall, NJ, 1997.

AEAV 206: Numerical Analysis and Applications Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on AEAV 205.

AEAV 215: Electronics-II

3.00 Contact Hour 3.00 Credit Hour

Frequency response of amplifiers: Poles, zeros and Bode plots, amplifier transfer function, techniques of determining 3 dB frequencies of amplifier circuits, frequency response of single-stage and cascade amplifiers, frequency response of differential amplifiers.

MOSFET: Structure and physical operation of an enhancement MOSFET, threshold voltage, Body effect, current- voltage characteristics of an enhancement MOSFET, biasing discrete and integrated MOS amplifier circuits, single-stage MOS amplifiers, MOSFET as a switch, CMOS inverter.
JFET: Structure and physical operation of JFET, transistor characteristics, and pinch-off voltage. Differential and multistage amplifiers: Description of differential amplifiers, small-signal operation, differential and common mode gains, RC coupled mid-band frequency amplifier.
Op-Amp: General purpose Op-Amp: DC analysis, small-signal analysis of different stages, gain and frequency response of 741 Op-Amp.

Negative feedback: properties, basic topologies, feedback amplifiers with different topologies, stability, frequency compensation. Active filters: Different types of filters and specifications, transfer functions, realization of first and second order low, high and bandpass filters using Op-Amps. Signal generators: Basic principle of sinusoidal oscillation, Op-Amp RC oscillators, and LC and crystal oscillators. Power Amplifiers: Classification of output stages, class A, B and AB output stages.

Introduction to PSPICE software and its different feature Frequency

Text and Ref books:

1. Semi Conductor Circuit Approximation - Albert P Malvino; Tata McGraw- Hill.
2. Electronic Devices and circuit – Jacob Millman & Christos C. Halkias; Tata McGraw-Hill.
3. Micro-Electronic Circuit Analysis and Design- Donald A. Neamen; McGraw-Hill.
4. Operational Amplifier and Linear integrated Circuit - Ramakant Gayakwad; Prentice Hall College Div.
5. Microelectronic Circuits – Adel S. Sedra & Keneth C. Smith; Oxford University Press.
6. Electronic Devices and Circuit Theory - R.L Boylsted; Prentice Hall of India Private Limited.
7. Introduction to PSPICE using OrCAD for circuits and electronics - Muhammad H. Rashid; Prentice Hall.

AEAV 216: Electronics-II Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on AEAV 215.

AEAV 217: Aircraft Electrical System

3.00 Contact Hour 3.00 Credit Hour

Electro-Mechanical System: Transformer: Ideal transformer, transformation ratio, no-load and load vector diagrams, transformer test, tosses of transformer, eddy current loss, hysteresis loss.
Generator: Excitation systems, equivalent circuit, vector diagrams at different loads, factor.
DC generator: Types, no load voltage characteristic, effect of speed on no-load and load characteristics and voltage regulation.
Three Phase Alternator: Overview, Principle of operation.
DC motor: Torque, counter emf, speed, torque-speed characteristics, starting and speed regulation.
Aircraft Electrical system: AC and DC power generations and supply in aircraft, Circuits and components, Concept of emergency power supply, aircraft batteries, types, capacity etc. external power supplies, Auxiliary Power Unit (APU), Components of power distribution, safety requirements, aircraft electrical wiring and lighting.

Text and Ref books:

1. Electric Machine and Transformers – Irving L. Kosow; Prentice Hall of India.
2. Aircraft Electrical and Electronic Systems - Mike Tooley and David Wyatt; Routledge.
3. A Text Book of Electrical Technology (Volume-II)- B L Theraja and A K Theraja; S.Chand& Company Ltd.
4. Aircraft Electrical Systems- EHJ Pallet; Pearson Education
5. Aircraft Electricity & Electronics- Thomas K Eismin, Tata McGraw-Hill
6. Electric Machinery Fundamental - Stephan J. Chapman; McGraw-Hill.

AEAV 218: Aircraft Electrical System Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAV 217.

AEAV 301: Digital Systems

3.00 Contact Hour 3.00 Credit Hour

Digital System: Introduction to number systems and codes. Analysis and synthesis of digital logic circuits: Basic logic functions, Boolean algebra, combinational logic circuits, minimization of combinational logic. Modular combinational circuit, Multiplexer, demultiplexer and their implementation in CMOS, decoder, encoder, comparators, Introduction to programmable logic devices. Sequential circuits: Different types of latches, flip-flops. Shift registers, counters and their applications. Introduction to memory devices and their structure.

Microprocessor: Introduction to microprocessors. Intel 8086 microprocessor: Architecture, addressing modes, instruction sets, assembly language programming, system design and

interrupt. Introduction to Interfacing: Programmable peripheral interface 8255, programmable timer 8254, programmable interrupt controller 8259 (Functional description, Command word setting, pin definitions to be covered), Microprocessor application in aircraft.

Text and Ref books:

1. Digital Logic and Computer Design- M Morris Mano; Prentice Hall of India Private Ltd.
2. Digital Fundamentals - Floyd; Prentice Hall International, Inc.
3. Pulse, Digital and Switching waveforms - Jacob Millman & Herbert Taub; Tata McGraw- Hill.
4. Microprocessor and Interfacing - Douglas V. Hall; Tata McGraw-Hill.
5. Microprocessor and Microprocessor Based System Design - Dr M. Rafiquzzaman; Universal Book Stall New Delhi.

AEAV 302: Digital Systems Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on AEAV 301.

AEAV 303: Signals and Systems

3.00 Contact Hour 3.00 Credit Hour

Classification of signals and systems: signals - classification, basic operation on signals, elementary signals, representation of signals using impulse function; systems – classification. Properties of Linear Time Invariant (LTI) systems: Linearity, causality, time invariance, memory, stability, invertibility. Time domain analysis of LTI systems: Differential equations - system representation, order of the system, solution techniques, zero state and zero input response, system properties; impulse response - convolution integral, determination of system properties; state variable - basic concept, state equation and time domain solution. Frequency domain analysis of LTI systems: Fourier series- properties, harmonic representation, system response, frequency response of LTI systems

Fourier transformation- properties, system transfer function, system response and distortion-less systems. Applications of time and frequency domain analyses: solution of analog electrical and mechanical systems, amplitude modulation and demodulation, time-division and frequency-division multiplexing.

Laplace transformation: properties, inverse transform, solution of system equations, system transfer function, system stability and frequency response and application.

Text and Ref books:

1. Continuous and Discrete Signals & Systems - S.S. Soliman & M. D. Srinath; Prentice Hall of India Private Ltd.
2. Signal and System (Continuous & Discrete) - R.E. Ziemer; Pearson Education Asia.
3. Feedback Control System - Phillips & Horbour; Prentice Hall.

4. Signals and Systems- Alan V. Oppenheim and Alan S. Willsky; Prentice Hall.

AEAV 305: Communication Engineering

3.00 Contact Hours 3.00 Credit Hour

Overview of communication systems: Basic principles & fundamental elements; Noise: Sources & characteristics.
Information theory: Measure of information, channel capacity of a continuous system and channel capacity;
Communication systems: Analog and digital.
Continuous wave modulation: Transmission types, Amplitude modulation: Introduction, double side band, single side band, vestigial side band, quadrature, spectral analysis of each type, envelope and synchronous detection.
Angle modulation: Instantaneous frequency, frequency modulation (FM) and phase modulation (PM), spectral analysis, demodulation of FM and PM. Pulse modulation: Sampling theorem, Nyquist criterion, aliasing, instantaneous and natural sampling. Pulse amplitude modulation: Principle, bandwidth requirements.
Pulse code modulation (PCM): Quantization principle, quantization noise, non-uniform quantization, signal to quantization error ratio, differential PCM, demodulation of PCM. Delta modulation (DM): Principle, adaptive DM, line coding – formats and bandwidths. Digital modulation: Amplitude-shift keying - Phase-shift keying (PSK): Frequency-shift Keying (FSK)
Multiplexing: Time division multiplexing (TDM) - principle, receiver synchronization, frame synchronization, TDM of multiple bit rate systems, frequency division multiplexing - principle, de-multiplexing, wavelength-division multiplexing.
Aircraft Communication System: Intercommunication System, VHF/UHF Communication, HF Communication, Satellite Communication, Emergency Locator Transmitter.

Text and Ref books:

1. Digital and Analog Communication System - Leon W. Couch; Pearson Education.
2. Communication System - Somon Haykin; John Wiley & Sons, Inc.
3. Modern Digital & Analog Communication System - B. P. Lathi; Oxford University Press.
4. Telecommunication Switching Systems and Networks - Thiagarajan Viswanathan; Prentice Hall of India Private Ltd.
5. Electronic Communication Systems-Kennedy & Davis; Tata McGraw Hill.

AEAV 306: Communication Engineering Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAV 305.

AEAV 307: Electromagnetic Field Theory

3.00 Contact Hour 3.00 Credit Hour

Static electric field: Postulates of electrostatics, Coulomb's law for discrete and continuously distributed charges, Gauss's law and its application, electric potential due to charge

distribution, conductors and dielectrics in static electric field, flux density - boundary conditions, capacitance - electrostatic energy and forces, energy in terms of field equations, capacitance calculation of different geometries, boundary value problems – Poisson's and Laplace's equations in different co-ordinate systems. Steady electric current: Ohm's law, continuity equation, Joule's law, resistance calculation. Static Magnetic field: Postulates of magnetostatics, Biot-Savart's law, Ampere's law and applications, vector magnetic potential, magnetic dipole, magnetization, magnetic field intensity and relative permeability, boundary conditions for magnetic field, magnetic energy, magnetic forces, torque and inductance of different geometries. Time varying fields and Maxwell's equations: Faraday's law of electromagnetic induction, Maxwell's equations - differential and integral forms, boundary conditions, potential functions, time harmonic fields and Poynting theorem. Plane electromagnetic wave: Plane wave in loss less media - Doppler effect, transverse electromagnetic wave, polarization of plane wave, plane wave in lossy media – low-loss dielectrics, good conductors, group velocity, instantaneous and average power densities, normal and oblique incidence of plane waves at plane boundaries for different polarization.

Text and Ref books:

1. Engineering Electromagnetics – W. H. Hayt Jr & John A. Buck; Tata McGraw-Hill Publishing Company Ltd
2. Fields and Waves in Communication Electronics - Simon Ramo; John Wiley & Sons.
3. Fundamentals of Engineering Electromagnetic - D.K. Cheng; Prentice Hall of India Private Ltd.

AEAV 313: Digital Signal Processing

3.00 Contact Hour 3.00 Credit Hour

Introduction to digital signal processing (DSP): Discrete-time signals and systems, analog to digital conversion, impulse response, finite impulse response (FIR) and infinite impulse response (IIR) of discrete-time systems, difference equation, convolution, transient and steady state response. Discrete transformations: Discrete Fourier series, discrete-time Fourier series, discrete Fourier transform (DFT) and properties, fast Fourier transform (FFT), inverse fast Fourier transform. Z transformation - properties, transfer function, poles and zeros and inverse Z transform. Correlation: Circular convolution, auto-correlation and cross correlation. Digital Filters: FIR filters - linear phase filters, specifications, design using window, optimal and frequency sampling methods.IIR filters – specifications, design using impulse invariant, bi-linear Z transformation, least-square methods and finite precision effects.
Introduction to Matlab Simulink application in DSP. Implementation of DSP in RADAR Engineering.

Text and Ref books:

1. Digital Signal Processing – John G.Proakis & Dimitris Manolakis; Prentice Hall.
2. Digital Signal Processing Using Matlab - Vinay K. Langle & John G. Proakis; CL-Engineering.
3. Digital Signal Processing - Thomas J. Cavicchi; John Wiley & Sons.
4. Digital Signal Processing-A practical approach– Emmanuel C. Ifeachor & Barrie W. Jervis; Prentice Hall.
5. Signal and System (Continuous & Discrete) - Rodger E. Ziemer, W. H. Tranter & D. R. Fannin; Pearson Education.

AEAV 324: Digital Signal Processing Sessional

1.50 Contact Hour 0.75Credit Hour

Sessional based on AEAV 313.

AEAV 317: Aircraft Electronic Systems

3.00 Contact Hour 3.00 Credit Hour

Integrated Cockpit Display System: Introduction, Cockpit Display System, Glass Cockpit, Warning Management, Display Unit, HUD, HDD, HMD, IEEE smart sensors.

Engine Control and Monitoring System: Principles of Operation, Engine Indications and Monitoring, Full Authority Digital Engine Control (FADEC) System.

Emergency Systems: Warning Systems, Fire Detection and Suppression, Emergency Oxygen, Passenger Evacuation, Cockpit Voice Recorder & Flight Data Recording System, Ice & Rain Protection System.

Text and Ref books:

1. Aeronautical Radio Communication Systems and Networks - Dale Stacey; Wiley
2. Aircraft Communications and Navigation Systems - David Wyatt, Mike Tooley: Routledge.
3. Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration - Ian Moir, Allan Seabridge: Wiley.
4. Aircraft Systems – David Lombardo: McGraw Hill.

AEAV 318: Aircraft Electronic Systems Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAV 317.

AEAV 327: Aircraft Navigation System-I

3.00 Contact Hour 3.00 Credit Hour

Introduction to Air Navigation: Phases of flight, Basic navigation and navigation parameters. Types of navigation- Inertial, Radio- terrestrial radio, satellite radio navigation, block diagram of navigation system.

Navigation Mathematics: Coordinate Frames, Coordinate transformation:- Direction cosine matrix, Euler angles.

Dead Reckoning (DR) Computation: Position, Radio Fix, LOS distances measurement, ranging, course computation (range & bearing), ADF, NDB.

Navigation Techniques: - Inertial Navigation System (INS), Sensors- Accelerometers, Gyroscopes (mechanical, ring laser, fiber optic), Inertial measurement unit (IMU), INS Errors.

Terrestrial Radio Navigation System: Hyperbolic Navigation-LORAN-C, Air Data Navigation, Doppler Navigation, Satellite Navigation

System Integration: INS characteristics, Inertial- Doppler integration, INS/ GNSS integration, loosely & tightly coupled systems, multisensory integration, Attitude, height and range measurement by integration. Civil & Military Aircraft Navigational Requirements.

Text and Ref books:

1. Avionics Navigation Systems – Myron Kayton; Wiley-Interscience.
2. Introduction to Avionics Systems- 3rd Edition, R.P.G. Collinson
3. Principles of Avionics - Albert Helfrick; Avionics Communication.
4. Avionics Fundamentals- Jeppesen; Highflyn.
5. Aerospace Avionics Systems- George M Siouris, Academic Press Inc.
6. Elements of Electronic Navigation- N S Nagaraja; McGraw-Hill.

AEAV 329: Measurement and Aircraft Instruments

3.00 Contact Hour 3.00 Credit Hour

Fundamentals: Generalized measurements systems, dimensions and units of measurements, causes and types of experimental errors, error and uncertainty analysis.
Air pollution sampling and measurements; Data acquisition and processing.
Introduction: Introduction to Basic-6 and Basic-T aircraft instruments, applications of instruments in aircraft, functional elements of a measurement system and classification of instruments.
Instrument display and layout: Qualitative, quantitative display, scale range, operating range, type of scales- linear, non-linear, circular, straight, dual displays and digital display; instrument grouping in cockpit.
Transducers: Primary, secondary, mechanical, electrical and optical.
Measurement of non-electrical quantities: Temperature, pressure, flow, level, force and torque.
Pitot-static group of Instruments: ASI, Altimeter, VSI, Mach meter: Construction, operating principle, square law compensation, introduction to Air Data Computer, TAS, CAS, IAS,
Aircraft Attitude & Indication system: Gyroscope & properties- Precession & rigidity, Gyro Horizon Indicator, Turn & Bank Indicator, construction and operating principle.
Measurement of Engine RPM: Torque measurement, Tacho probe.
Temperature Measurement: Thermocouple, Radiation pyrometer, PRTD, air temperature sensors- Principle application in aviation.

Fuel flow and quantity measurement: Resistive & Capacitive transducer, aircraft fuel measurement system, compensation for aircraft attitude and non-uniform tank contour.
Basic elements of signal conditioning: Instrumentation amplifier, noise and source of noise, noise elimination compensation, A/D and D/A converters, sample and hold circuits. Data acquisition system.
Digital Data Transmission Lines: Data buses, MIL STD 1553, ARINC 429, Optical data buses.

Text and Ref books:

1. Aircraft Instruments and integrated Systems- EHJ Pallet; Pearson Education Publishers.
2. Aircraft Electricity and Electronics- Thomas Eismin; Glencoe.
3. Modern Electronic Instrumentation and Measurement Techniques - Albert D Helfrick; Prentice Hall of India private Ltd.
4. Federal Aviation Agency (FAA) Hand Book of Flying: Flight Instruments.
5. Electrical Electronics Measurement and Instrumentation - A.K. Sawheney; Dhanpat Rai and Company Private Ltd.

AEAV 330: Measurement and Aircraft Instruments Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on AEAV 311.

AEAV 400: Project and Thesis

6.00 + 6.00 Contact Hour 3.00 + 3.00 Credit Hour

In this course, students are required to undertake a major project in engineering analysis, design and development of research related to Avionics Engineering. The objective is to provide an opportunity to develop initiative, self-reliance, creative ability and engineering judgment. The results must be submitted in a comprehensive report with appropriate drawings, charts, bibliography, etc. along with products if any. Use of locally available materials in manufacturing and feasibility study of local industrial units will be emphasized.

AEAV 401: Microwave Engineering

3.00 Contact Hour 3.00 Credit Hour

Transmission lines: Voltage and current in ideal transmission lines, reflection, transmission, standing wave, impedance transformation, Smith chart, impedance matching and lossy transmission lines. Waveguides: General formulation, modes of propagation and losses in parallel plate, rectangular and circular waveguides. Microstrips: Structures and characteristics. Rectangular resonant cavities: Energy storage, losses and Q. Radiation: Small current element, radiation resistance, radiation pattern and properties, Hertzian and halfwave dipoles. Antennas: Mono pole, horn, rhombic and parabolic reflector, array, and Yagi-Uda

antenna. Microwave devices: Klystron, Magnerton, TWT and Twystron are used as microwave oscillators and amplifiers.

Text and Ref books:

1. Microwave Devices and Circuits - Samuel Y. Liao; Prentice Hall of India.
2. Foundations for Microwave Engineering - E. Colliong; McGraw-Hill International.
3. Microwave Engineering - M.Pozar; Addision Wesley Publishing Company**.**
4. Antenna Theory Analysis and Design - C.A. Balanis; John Wiley & Sons.

AEAV 442: Microwave Engineering Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAV 401.

AEAV 407: Radar Engineering

3.00 Contact Hour 3.00 Credit Hour

Introduction to Radar: Radar Principle, Functional block diagrams, Radar range equation, Radar frequencies, Pulse repetition frequency and Range ambiguity, Minimum detectable signal.
Radar cross-section of targets: Detection and tracking, jamming techniques.
Doppler Effect: Continuous wave and frequency modulation radars, moving target indicator and phase-Doppler radars.
Radar transmitter: Magnetron oscillator, klystron amplifier and traveling wave tube amplifier.
Radar antenna: Antenna parameters, radiation pattern and aperture distribution.
Radar receivers: Displays and duplexers.
Electronic Warfare: Electronic counter measures, Electronic counter counter measures.
Introduction to Airborne Radar.

Text and Ref books:

1. Introduction to RADAR systems - M. Skolnik; McGraw-Hill International.
2. Principle of Radar - Tomay; Prentice Hall of India.
3. Radar design, principles, signal processing and the environment - Fred E Nathanson, Prentice Hall of India Private Ltd.
4. Introduction to Electronic Defense System- Flippo Neri; Artech House Publishers

AEAV 408 Radar Engineering Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAV 407.

AEAV 411: Control Systems Engineering

3.00 Contact Hour 3.00 Credit Hour

Introduction to control systems. Linear system models: Transfer function, block diagram and signal flow graph (SFG). State variables: SFG to state variables, transfer function to state variable and state variable to transfer function. Feedback control system: Closed loop systems, parameter sensitivity, transient characteristics of control systems, effect of additional pole and zero on the system response and system types and steady state error. Routh stability criterion. Analysis of feedback control system: Root locus method and frequency response method. Design of feedback control system: Controllability and observability, root locus, frequency response and state variable methods. Digital control systems: introduction, sampled data systems, stability analysis in Z-domain.

Text and Ref books:

1. Modern Control Systems – Richard C. Dorf and Robort H Bishop; Pearson Education Private Ltd.
2. Control System Engineering- Norman S. Nise; Wiley
3. Linear Control System Analysis and Design. - John J.D. Azzo & Constantine H. Houpis; McGraw-Hill International.
4. Modern Control Engineering - Ktsuhiko Ogata; Prentice Hall.

AEAV 412: Control Systems Engineering Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAV 411.

AEAV 447: Aircraft Navigation System-II

3.00 Contact Hour 3.00 Credit Hour

Introduction: Methods of navigation, radio direction finding, automatic direction finder, radio compass.
VHF Omni directional Range: - Light House Principle, Frequency Spectrum, Wave Equation, Errors and limitations.
Radio Navigation: Non Directional Beacon and Radio Direction Finding, Loop Antenna, Sense Aerial, Ambiguity Resolve, Limitations. Radio Altimeter, Ground Proximity Warning System.
Distance measuring equipment (DME):- DME operation, Mathematical Relations, Signal Equation (Gaussian Pulse), Mode of operation, TACAN.
Instrument Landing System (ILS):- Mathematical Relations, Antenna Array Arrangement, Beam pattern Geometry of LOC and GS, Development and concepts of Microwave Landing System.
Doppler Navigation: - Principle of operation, Beam configuration, Frequency Spectrum. Secondary Radar:- Concept of Secondary Radar, MODE-A,C,S Signal Format and types of transmission, ATC-RBS Interrogation-Reply Pulse, Technical features.

Traffic Alert Collision Avoidance System: Introduction, Basic operating principle, Block diagram and system description, Controls and display.
Flight Management System: Introduction, basic operating principle, block diagram and system description, controls and display.

Text and Ref books:

1. Avionics Fundamentals- Jeppesen; Highflyn.
2. Principles of Avionics - Albert Helfrick; Avionics Communication.
3. Digital Avionics Systems Principles and Practice - R. Spitzer; The Blackburn Press.
4. Antennas and Wave propagation- 4th Edition, John D Kraus, Ronald J Marhefka; McGraw-Hill
5. Avionics Navigation Systems – Myron Kayton; Wiley-Interscience
6. Elements of Electronic Navigation- N S Nagaraja; McGraw-Hill.

AEAV 448: Aircraft Navigation System-II Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on AEAV 447.

AEAV 453: Aircraft Stability Control and Missile Guidance

3.00 Contact Hour 3.00 Credit Hour

Importance and significance of flight stability and control - Static Longitudinal, Directional and Lateral stability with respect to the aircraft axis systems; Effect of various wings design and secondary control surfaces; Origin of symmetric forces and moments; Static and maneuvering longitudinal stability, equilibrium and control of rigid aircraft; Effects of various major components on Static Stability, Critical flight conditions and controls requirement.

Introduction to automatic flight control: Setup of the flight control system, System performance specification: - Requirements on flying and handling qualities and Parameters. Stability augmentation systems: - Dampers-Acquiring static stability, Feedback-Acquiring static stability. Basic autopilot systems: - Basic Longitudinal and Lateral autopilot systems, Navigational autopilot systems: - Longitudinal and Lateral autopilot systems.

Missile guidance techniques: Gguidance and sensor systems; Prediction techniques for missile aerodynamics; Navigational guidance, Command guidance, Comparison of guidance system performances. Physics and accuracy of missile sensors and effect on guidance. Homing Guidance systems.

Text and Ref books:

1. Linear Control System Analysis and Design. - John J.D. Azzo & Constantine H. Houpis; McGraw-Hill International.

2. Modern Control Systems – Richard C. Dorf and Robort H Bishop; Pearson Education Private Ltd.
3. Flight Stability and Automatic Control - Robert C. Nelson; McGraw-Hill.
4. Automatic Flight Control - EHJ Pallet; Wiley-Blackwell.
5. Automatic Control of Aircraft and Missiles - John H Blacklock; John Wiley & Sons.

Optional / Elective Courses (Avionics Discipline)

AEAV 413: Mobile Cellular Communications

3.00 Contact Hour 3.00 Credit Hour

Introduction: Concept, evolution and fundamentals. Analog and digital cellular systems. Cellular Radio System: Frequency reuse, co-channel interference, cell splitting and components. Mobile radio propagation: Propagation characteristics, models for radio propagation, antenna at cell site and mobile antenna. Frequency Management and Channel Assignment: Fundamentals, spectrum utilization, fundamentals of channel assignment, fixed channel assignment, non-fixed channel assignment, traffic and channel assignment. Handoffs and Dropped Calls: Reasons and types, forced handoffs, mobile assisted handoffs and dropped call rate. Diversity Techniques: Concept of diversity branch and signal paths, carrier to noise and carrier to interference ratio performance. Digital cellular systems: Global system for mobile, time division multiple access and code division multiple access.

Text and Ref books:

1. Mobile Cellular Telecommunication (Analog Digital Systems) - William C.Y Lee; McGraw-Hill.
2. Mobile & Personal Communication System & Series - Raj Pandya; IEEE Press, Prentice Hall of India.
3. Wireless Digital Communications - Dr. Kamilo Feher; Prentice Hall of India.
4. Mobile Communication satellites theory and application - Ton Logadon; McGraw-Hill International.

AEAV 415 Satellite Communications

Contact Hours 3 Credit Hours 3

Introduction, satellite classification, solution of the space segment, evolution of the ground segment, very large aperture terminal, large and medium size antennas, small antennas, international telecommunication satellite, business service or equivalent VSATs, extra small aperture terminals, non-parabolic satellite antennas, voice-data-video applications, characteristics of satellite networks, VSAT technologies, elements of VSAT networks, regulatory issues, benefits of VSATs, overview of a VSAT network, applications of VSATs, VSAT network configurations, protocols and interfaces, assuring system compatibility requirements, economics of VSAT networks, advanced concepts.

Text and Ref books:

1. Digital Satellite Communications - Tri T. Ha; McGraw-Hill International.

2. Satellite Communication Mobile & Fixed Services - Michael J. Miler; Kluwer Academic Publisher.
3. Satellite Communications - T. Pratt, C. Bostian, J. Allnut; John Wiley & Sons Inc.
4. Mobile Communication satellites theory and application – Ton Logadon; McGraw-Hill International.

AEAV 417 Optoelectronics

3.00 Contact Hour 3.00 Credit Hour

Optical properties in semiconductor: Direct and indirect band-gap materials, radiative and non-radiative recombination, optical absorption, photo-generated excess carriers, minority carrier life time, luminescence and quantum efficiency in radiation. Properties of light: Particle and wave nature of light, polarization, interference, diffraction and blackbody radiation. Light emitting diode (LED): Principles, materials for visible and infrared LED, internal and external efficiency, loss mechanism, structure and coupling to optical fibers. Stimulated emission and light amplification: Spontaneous and stimulated emission, Einstein relations, population inversion, absorption of radiation, optical feedback and threshold conditions. Semiconductor Lasers: Population inversion in degenerate semiconductors, laser cavity, operating wavelength, threshold current density, power output, hetero-junction lasers, optical and electrical confinement. Introduction to quantum well lasers. Photo-detectors: Photoconductors, junction photo-detectors, PIN detectors, avalanche photodiodes and phototransistors. Solar cells: Solar energy and spectrum, silicon and Schottkey solar cells. Modulation of light: Phase and amplitude modulation, electro-optic effect, acousto-optic effect and magneto optic devices. Introduction to integrated optics.

Text and Ref books:

1. Optoelectronics – an Introduction - J. Wilson, J.F.B. Hawkes; Prentice Hall of India Private Ltd.
2. Optical Electronics in Modern Communications - Amnon Yariv; Oxford University Press.
3. Optical Fiber Communications: Principles & Practice - John M. Senior; Prentice Hall.
4. Introduction to optical Electronics – A. Jones; Harper & Row.
5. Electro-optical System Design for Information Process – L. Wyatt; McGraw-Hill.
6. Modern optical Engineering the design of optical sys – J. Smith; SPIE Press McGraw-Hill.

AEAV 419 Electronic Warfare

3.00 Contact Hour 3.00 Credit Hour

Modern electronic warfare (EW) systems: Architecture, types and technology. EW signal processing: Modern EW operation, software control of EW sets. Role of expendables: Chaff and decoys. Comparing EW receiver capabilities. Airborne EW: Technology evolution. Advanced EW technical approaches, EW and radar bands, anti-radiation missiles, advanced threat radars and missile systems, countering missile systems, maneuverability and speed considerations. RF and IR seekers, digital RF memory, camouflage jamming, search radar jamming, high ERP generation, directed energy weapons and stealth technology, countering

stealth technology, high power microwave weapons, propagation limitations, high energy lasers and charged particle beam weapons.

Text and Ref books:

1. Electronic Defense Systems - Filippo Neri; Artech House Publishers.
2. Electronic warfare in Information Age - D. Curtis Schleher; Artech House Publishers.
3. Electronic Warfare - JPR Browne; Brassey's London.

AEAV 421 Optical Fiber Communications

3.00 Contact Hour 3.00 Credit Hour

Introduction to Optical Fiber Communication. Light propagation through optical fiber: Ray optics theory and mode theory. Optical fiber: Types and characteristics, transmission characteristics, fiber joints and fiber couplers. Light sources: Light emitting diodes and laser diodes. Detectors: PIN photo-detector and avalanche photo-detectors. Receiver analysis: Direct detection and coherent detection, noise and limitations. Transmission limitations: Chromatic dispersion, nonlinear refraction, four wave mixing and laser phase noises. Optical amplifier: Laser and fiber amplifiers, applications and limitations. Multi-channel optical system: Frequency division multiplexing, wavelength division multiplexing and optical CDMA. Radio on fiber technology, Fiber optic access networks.

Text and Ref books:

1. Optical Fiber Communications: Principles & Practice - John M. Senior; Prentice Hall of India.
2. Fiber Optic Communications - D C Agrawal; Wheeler Publishing.
3. Fiber Optic Communication System - Gerd Keiser; McGraw-Hill International.
4. Optical Communication System - John Gower; Prentice Hall of India.
5. Modern optical Engineering the Design of Optical Sys. – J. Smith; SPIE Press McGraw-Hill.

AEAV 435 Computer Networks

3.00 Contact Hour 3.00 Credit Hour

Switching and multiplexing: ISO, TCP-IP and ATM reference models. Different data communication services: Physical layer wired and wireless transmission media. Cellular radio: Communication satellites; data link layer: Elementary protocols. Sliding window protocols. Error detection and corrections. HDLC. DLLL of Internet. DLLL of ATM: Multiple Access protocols. IEECE.802 Protocols for LANs and MANs. Switches. Hubs and bridges. High speed LAN Network Layer: Routing, congestion control, internetworking. Network layer in internet: IP protocol, IP addresses. ARP; NI in ATM transport layer, transmission control protocol. UDP. ATM adaptation layer, application layer, network security, email, domain name system. Simple network management protocol, HTTP and world wide web.

Text and Ref books:

1. Computer Network- Andrew S. Tanenbaum; Prentice Hall of India Private Ltd.
2. Data and Computer Communications – William Stallings; Prentice Hall of India.
3. Computer Network and Distributed Processing – James Martin; Prentice Hall of India Private Ltd.
4. Data Communication and Distributed Network – Uyless D. Black; Prentice Hall of India Private Ltd.

Courses offered by Avionics Engg. discipline to Aerospace students

AEAV 451: Avionics Technology

3.00 Contact Hour 3.00 Credit Hour

Introduction to Air Navigation: Phases of flight, Basic navigation and navigation parameters. Types of navigation- Inertial, Radio- terrestrial radio, satellite radio navigation, block diagram of navigation system. Coordinate Frames, Coordinate transformation, Frame of Reference, Dead Reckoning (DR) Computation.

Navigation Techniques:-Inertial Navigation System (INS), Sensors- Accelerometers, Gyroscopes, Inertial measurement unit (IMU).
Terrestrial Radio Navigation System; Hyperbolic Navigation, Air Data Navigation, Doppler Navigation, Satellite Navigation, Automatic Direction Finder (ADF), Distance Measuring Equipment (DME) , VHF Omni-directional Range (VOR), Instrumental Landing System (ILS).

Aero Instrumentation: Introduction to Basic-6 and Basic-T aircraft instruments, applications of instruments in aircraft, functional elements of a measurement system and classification of instruments.

Communication: Overview of communication systems: Basic principles & fundamental elements. Continuous wave modulation: Amplitude modulation-demodulation, frequency modulation (FM)-demodulation.
Radar Systems: Radiation and propagation, waveguides, transmission lines, antennas, communication systems, microwave device and radar systems.

Text and Ref books:

1. Avionics Fundamentals- Jeppesen; Highflyn.
2. Principles of Avionics - Albert Helfrick; Avionics Communication.
3. Digital Avionics Systems Principles and Practice - R. Spitzer; The Blackburn Press.
4. Antennas and Wave propagation- 4th Edition, John D Kraus, Ronald J Marhefka; McGraw-Hill Introduction to Radar System -M I Skolnik, McGraw-Hill, London, 1980
5. Modern Digital & Analog Communication System - B. P. Lathi; Oxford University Press.

AEAV 452: Avionics Technology Sessional

1.50 Contact Hour 0.75 Credit Hour

Sessional based on AEAV 451.

AEAV 461: Control Engineering

3.00 Contact Hour 3.00 Credit Hour

Introduction to Control System, Modeling dynamic Systems, Linearization of physical models, System response, Solution of differential equations, Laplace Transformation, Transfer function, Block diagram and signal flow graphs, Feedback control System, Frequency response

System analysis; Nyquist Diagrams, Bode Diagrams and Nicholas chart, Root-locus plots, System compensation, Digital Control Systems, Sample data systems, The Z-Transformation, Stability analysis in the Z-plane.

Text and Ref books:

1. Control Systems Engineering - Norman S. Nise; Wiley.
2. Modern Control System - Richard C. Dorf and Robert H. Bishop, Pearson Education Private Ltd.

AEAV 409 Microprocessor and Interfacing

3.00 Contact Hour 3.00 Credit Hour

Introduction to microprocessors. Intel 8086 microprocessor: Architecture, addressing modes, instruction sets, assembly language programming, system design and interrupt. Interfacing: Programmable peripheral interface, programmable timer, serial communication interface, programmable interrupt controller, direct memory access, keyboard and display interface. Introduction to micro-controllers.

Text and Ref books:

1. Microprocessor and Interfacing - Douglas V. Hall; Tata McGraw-Hill.
2. Microprocessor and Microprocessor Based System Design - Dr M. Rafiquzzaman; Universal Book Stall New Delhi.

CHAPTER 6

DETAIL OUTLINE OF UNDERGRADUATE COURSES OFFERED BY OTHER DEPARTMENTS TO AE STUDENTS

Phy 115: Physics I (Waves and Oscillation, Optics and Thermal Physics)

3.00 Contact Hour 3.00 Credit Hour

Waves & Oscillations: Differential equation of a Simple harmonic Oscillator; Total energy and average energy, Combination of simple harmonic oscillations Lissajous' figures; Spring-mass system, Calculation of time period of torsional pendulum, Damped oscillation, forced oscillation, Resonance, Two-body oscillations, Reduced mass, Differential equation of a progressive wave, Power & intensity of wave motion, Stationary wave, Group velocity and Phase velocity, Architectural Acoustics, Reverberation and Sabines's formula, Requisites for good acoustics.

Optics: Combination of lenses: equivalent lens and equivalent focal length; Cardinal points of a lens; Power of a lens; Defects of images: Spherical aberration, Astigmatism, Coma, Distortion, Curvature, Chromatic aberration; Interference of light, Young's double slit experiment, displacement of fringes and its use, Fresnel's bi prism, Newton's ring, Diffraction by single slit, diffraction from a circular aperture, Diffraction by double slit, Optical instruments: Compound microscope, Polarizing microscope; Resolving power of a microscope; Camera and photographic techniques.

Thermal Physics: Heat and work – the first law of thermodynamics and its applications; Kinetic theory of gases – kinetic interpretation of temperature, specific heats of ideal gases, equi-partition of energy, mean free path, Maxwell's distribution of molecular speeds, reversible and irreversible processes; Carnot's cycle; Second law thermodynamics, Carnot's theorem, entropy, thermodynamic function; Maxwell relations; Clausius and Clapeyron equation.

Text and Ref books:

1. A Text Book of Sound – N Subrahmanyamand Brij Lal.
2. Waves and Oscillations – N Subrahmanyam and Brij Lal.
3. A Text Book of Optics - N Subrahmanyam and Brij Lal.
4. Heat and Thermodynamics- N Subrahmanyam and Brij Lal
5. Fundamentals of Physics- Halliday, Resnick, Walker
6. Physics part-1- Resnick and Halliday.
7. Physics Part-11- Resnick and Halliday.

Phy 116: Physics Sessional

3.00 Contact Hour 1.50 Credit Hour

Sessional based on Phy 115.

Phy 117: Phy II (Electricity and Magnetism, Modern Physics and Mechanics)

3.00 Contact Hour 3.00 Credit Hour

Electricity and Magnetism: Electric charge, Coulomb's charge; Coulomb's law; The electric field; Calculation of electric flux and Gauss's law; Some application of Gauss's law; Electric potential V; Relation between E and V; Electric potential energy; Capacitors;

Capacitance; Dielectrics and atomic view; Dielectrics and Gauss's law; Current and resistance; Current density; Ohm' law; Resistivity - an atomic view; Ampere's law; Faraday's law; Lenz's law; Self inductance and mutual inductance; Magnetic properties of matter: magnetomotive force, magnetic field intensity, permeability, susceptibility; Classifications of magnetic materials; Magnetization curves.

Modern Physics: Michelson Morley's experiment; Galilean transformation; Special theory of relativity; Lorenz transformation; Relative velocity; Length contraction; Time dilation; Mass-energy relation; Photo-electric effect; Compton effect; de Broglie wave; Bohr's atomic model; Radioactive decay, half life, mean life; Isotopes; Nuclear binding energy; Alpha, beta, gamma decay.

Mechanics: Linear momentum of a particle, linear momentum of a system of particles, conservation of linear momentum, some application of momentum principle; angular momentum of a particle, angular momentum of a system of particles, Kepler's law of planetary motion, the law of universal Gravitation, the motion of planets and satellites, introductory quantum mechanics, wave function, uncertainty principle, postulates, Schrodinger time independent equation, expectation value, Probability, Particle in a zero potential, calculation of energy.

Text and Ref books:

1. Perspective of Modern Physics – Arthur Beiser.
2. Concept of Modern Physics – Arthur Beiser.
3. Physics Part-I – David Halliday &Robert Resnick.
4. Physics Part-II – David Halliday and Robert Resnick.

Chem 105: Chemistry (Atomic Structure, Thermo-chemistry and Chemistry of Engineering Materials)

4.00 Contact Hour 4.00 Credit Hour

Atomic Structure: Quantum numbers; Electronic configuration; Periodic table; Properties and uses of noble gases; Different types of chemicals and their properties; Molecular structure of compounds; Selective organic reactions.
Thermo-chemistry: Chemical kinetics; Chemical equilibrium; Ionization of water and pH concept; Electric properties of solution.
Chemistry of Engineering Materials: Corrosion: nature, forms and types of corrosion, electrochemical mechanism and prevention of corrosion. Paints, varnishes and metallic coating: composition and application of paints, varnishes and metallic coatings, methods used in applying coatings on metal surface. Carbon: properties and applications of carbon and graphite. Lubricants: principle of lubrication, sources, properties and refining of lubricants, importance of lubrication.
Plastic: Fundamentals characteristics, classification, raw material & manufacture of plastic, some typical example and their uses.

Text and Ref books:

1. Principles of Physical Chemistry – Haque & Nawab; Students' Publications.
2. Fundamentals of Physical Chemistry- Samuel H. Maron & Jerome B. Lando; MacMillan Publishing Co., Inc., Newyork.

3. Physical Chemistry P. W. Atkins; Oxford University Press.
4. Essentials of Physical Chemistry- B.S. Bahl & G.D. Tuli; S. Chand and Company Ltd.

Chem 106: Chemistry Sessional

3.00 Contact Hour 1.50 Credit Hour

Volumetric analysis: acid-base titration, oxidation-reduction titration; Determination of Fe, Cu and Ca volumetrically.

Math 121: Math I (Differential and Integral Calculus)

3.00 Contact Hour 3.00 Credit Hour

SECTION-A (DIFFERENTIAL CALCULUS)
Limit, continuity and differentiability, successive differentiation of various types of functions, Leibnit'z theorem, Rolle's theorem, Mean Value theorem, expansion in finite and infinite forms, Lagrange's form of remainder, Cauchy's form of remainder (expansion of remainder), expansions of functions differentiation and integration, indeterminate form, Cartesian differentiation, Euler's theorem, tangent and normal, sub tangent and subnormal in cartesian and polar coordinates, maxima and minima of functions of single variables, curvature, asymptotes.

SECTION-B (INTEGRAL CALCULUS)
Definition of integrations, integration by the method of substitution, integration by parts, standard integrals, integration by the method of successive reduction, definite integrals and its use in summing series, Walli's formula, improper integrals, beta function and gamma function, multiple integral and its application, area, volume of solid revolution, area under a plain curve in Cartesian and polar coordinates, area of the region enclosed by two curves in Cartesian and polar coordinates, arc lengths of curves in Cartesian and polar coordinates.

Text and Ref books:

1. A text Book of Differential Calculus – Rahman and Bhattachrjee.
2. Differential Calculus – Shanti Narayan.
3. Differential Calculus – Dr. B. D. Sharma.
4. Differential Calculus – Das and Mukhajee.

Math 123: Math II (Vector Analysis and Complex Variables)

3.00 Contact Hour 3.00 Credit Hour

SECTION-A (VECTOR ANALYSIS)

Definition of vector, Equality of direction ratios and vectors, Addition and multiplication of vectors, Triple products and multiple products, Differentiation of vectors, Gradient of scalar functions, Divergence and curl of point functions, Physical significance of gradient,

divergence and curl, integration of vectors (line, surface and volume integrals); Green's, Stoke's and Gauss's theorem and their application.

SECTION-B (COMPLEX VARIABLE)

Complex number system, General functions of a complex variable, Limits and continuity of a function of complex variable and related theorems, Complex function, differentiation and the Cauchy - Riemann Equations, Line integral of a complex function, Cauchy's Integral Formula, Liouville's Theorem, Taylor's and Laurent's Theorem, Singular Residues, Cauchy's Residue Theorem.

Text and Ref books:

1. Theory and Problems of Complex Variables – Marray R Sprigel.
2. Theory and functions of complex variables – Shanti Narayan.
3. Vector Analysis – Dr. Muhammad Abdus Sattar.
4. Vector Analysis – M. D. Raisinghania.

Math 125: Math III (Ordinary and Partial Differential Equations and Laplace Transforms)

3.00 Contact Hour 3.00 Credit Hour

SECTION-A (ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS)

a. Ordinary Differential Equations. Formulation of Differential Equations, Solution of first order but higher degree differential equations, Solution of first order differential equations by various methods, Solution of general linear equations of second and higher orders with constant co-efficient, Solution of Homogeneous linear equations and its applications, Solution of differential equations by the methods based on the factorization of the operators.

b. Partial Differential Equations. Introduction, Linear and non linear first order equations, Standard forms of linear equations of higher order, Equation of second order with variable coefficients.

SECTION-B (LAPLACE TRANSFORM)

Definition. Laplace transforms of some elementary functions. Sufficient conditions for existence of Laplace transform, Inverse Laplace transforms. Laplace transforms of derivatives. The unit step function. Periodic function, some special theorems on Laplace transform, Partial fraction. Solutions of differential equations by Laplace transform. Evaluation of improper integral.

Text and Ref books:

1. Ordinary and Partial differential Equations – M. D. Raisenghania.
2. Differential Equations – M. L. Khanna.
3. Differential Equations – B. D. Sharma.

4. Differential Equations – P. N. Chatterjee.

Math 221: Math IV (Matrices, Coordinate Geometry and Harmonic Analysis)

3.00 Contact Hour 3.00 Credit Hour

SECTION-A (MATRICES)

Definition of matrix; Different types of matrices; Algebra of matrices; Adjoint and inverse of a matrix; Elementary transformations of matrices; Matrix, polynomials; Calay-Hamilton theory with uses of rank and nullity; Normal and canonical forms; Solution of linear equations; eigen values and eigenvectors. Definition and properties of vector space, subspaces, basis and dimension, change of basis; linear 'transformation (LT) its definition and properties, linear operator matrix, geometry of LT, standard plane LT

SECTION-B (COORDINATE GEOMETRY AND HARMONIC FUNCTIONS)

Coordinate Geometry: System of coordinates, Distance between two points, section formula, Direction ratios and direction cosines, Projections: Equation of planes and lines.

Harmonic Functions: Definition of harmonics; Laplace's equation in Cartesian, polar, cylindrical and spherical coordinates; Solutions of these equations together with applications; Gravitational potential due to a ring; Steady state temperature; Potential inside or outside of a sphere; Properties of harmonic functions.

Text and Ref books:

1. Martices and Linear Transformations – Mohammad Iman Ali.
2. Martrics _ M. L. Khanna.
3. An Introduction to Matrices – S. C. Gupta.
4. Matrics – Frand Asyres, JR.

Math 225: Math V (Fourier Analysis and Statistic)

3.00 Contact Hour 3.00 Credit Hour

SECTION-A: FOURIER ANALYSIS

Real and complex form. Finite transform: Fourier Integral. Fourier transforms and their uses in solving boundary value problems.

SECTION-B: STATISTICS

Frequency distribution, measures of central tendency and dispersion; Variation, skewness and kurtosis; Concept of probability, conditional probability and Bayes' theorem; Probability distributions ie. Binomial, Poisson, negative exponential, normal and Weibull. Sampling of mean and standard deviation by normal; Chi-square and F distributions; Sampling theory;

Estimation; Hypothesis testing; Inference including t-tests; Regression analysis; Analysis of variance.

Text and Ref books:

1. Introduction to Statistics (3rd edition) by Ronald E Walpole, Macmillan, 1990.
2. Probability and Statistics for Engineers by Scheaffer & McClave.
3. Statistics and Random Processes by B. Praba, Aruna Chalam and Sujatha.
4. Quality Planning and Analysis – J. M. Juran & F. M. Gryna.

Hum 111: English

3.00 Contact Hour 3.00 Credit Hour

Introduction; Importance and Mastering various approaches to learning English; Phonetics - Phonetic systems, correct English pronunciation; Grammar - Construction of sentences; Grammatical problems – Grammar and usages, comprehension, paragraph writing, precis writing, amplification; Approaches to communication - communication today, business communication; Report Writing – Purpose of a report, classification of reports, organizing a report, writing short report, preparing complete analytical report, analysis and illustration of a report, problems in writing reports; Methods of Writing - business letter, tenders and quotations, resumes and job letters, journal articles, technical and scientific presentation; Research Study – Definition and purpose, research methodology, data analysis, thesis presentation.

Text and Ref books:

1. Prose of our Time – Nawroze Kitabstwn.
2. Business correspondence and report writing – R. C. Sharma & Krisnamohon.
3. A guide to correct speeh – S. M. Amanullah.
4. Advance learners Degree general English – Chowdhury and Hossain.

Hum 112: Technical Report Writing and Presentation

3.00 Contact Hour 1.50 Credit Hour

Tutorial Discussion – On a given topic to test the proper use of phonetics, pronunciation grammar, logic and confidence; Public Speaking – Demonstration by teacher for a short specific period, speaking by students (each student minimum twice) on different but easy given topic, well in advance as per a schedule maximum for 3 to 4 minutes for each student; Extempore – Minimum two presentations by each student for a duration of maximum 3 to 4 minutes; Debriefing on public speaking and extempore presentation ; Presentation – On a given professional topic or on a given research paper using power point for 40 minutes followed by question and answer session. Group presentation or different given topics by the students using power point.

Text and Ref books:

1. Business correspondence and report writing – R. C. Sharma & Krisnamohon.

Hum 209: Sociology

3.00 Contact Hour 3.00 Credit Hour

Basic concepts of sociology; Science, technology and social evolution; Globalization and changing world; Techniques of production, Culture and civilization, Population and world resources; Historical background of emergence of Bangladesh; Groups and Organizations, Government and Politics.

Socialization; Poverty social exclusion and welfare; Women and Development; Crime, deviance and social control; Environment and risk; Sustainable development; Rural sociology; Family urbanization and industrialization; Urban ecology; Collective behavior and social movements;

Text and Ref books:

1. Sociology (4^{th} edition) – Anthony Gidders, Publisher – Excel Media, India.
2. Sociology: Primary Principles – C. N. Shankar Raw, Publisher – S. Chand Co Ltd.
3. Sociology (Rev. ed.) – T. B. Bottomore.
4. Sociology by Richard Schaefer
5. Sociology by Anthony Giddens
6. Sociology by C N Shankar Rao

Hum 211: Principles of Accounting

3.00 Contact Hour 3.00 Credit Hour

Accounting elements: the accounting equation, accounts, transactions, the double entry mechanism; Accounting procedure: the financial statements.

Cost in general: objectives and classifications; Overhead costs: allocation and apportionment.

Product costing: cost sheet under job costing, operating costing and process costing; Costing by products and joint products; Marginal costing: tools and techniques; Cost-volume-profit analysis.

Designing the optimal product mix; Relevant costing: analysis, profitability within the firm; Guidelines for decision making: short-run decisions.

Long-run planning and control: capital budgeting; The master budget, flexible budget and standard cost; Variance analysis.

Text and Ref books:

1. Accounting Principles (Special Edition) – Hermanson, Edwards, Salmonson, Publisher – Business Publication INC, Plano Texas 75075.
2. Cost Accounting – Bhabatosh Banerje, Publisher – World Press.
3. Cost and Management Accounting – Dancan Williamson, Publisher – Prentice Hall of India.
4. Introduction to Management Accounting – Horngren, Publisher – Prentice Hall of India.

Hum 221: Engineering Ethics

3.00 Contact Hour 3.00 Credit Hour

Definition and scopes of Ethics; Different branches of ethics; Social change and the emergence of new technologies; History and development of engineering ethics; Science and technology- necessity and application; Study of ethics in engineering; Applied ethics in engineering.

Human qualities of an engineer; Obligation of an engineer to the clients; Attitude of an engineer to other engineers; Measures to be taken in order to improve the quality of engineering profession.

Ethical expectation: Employers and employees, inter-professional relationship, professional organization – maintaining a commitment of ethical standards; Desired characteristics of a professional code; Institutionalization of ethical conduct.

Text and Ref books:

1. Engineering ethics-Carles E. Haris

Hum 305: Economics

3.00 Contact Hour 3.00 Credit Hour

Microeconomics: Definition of economics; Fundamentals of economics; Market and government in a modern economy; Basic elements of supply and demand; Choice and utility; indifference curve technique; Analysis of cost; Short run long run theory of production; Analysis of Market; Optimization; Theory of distribution.

Macroeconomics: key concept of macroeconomics; Saving, consumption, investment; National income analysis; Inflation, Unemployment; Fiscal and monetary policy.

Development: Theories of developments; Economic problem of developing countries; Planning in Bangladesh.

Text and Ref books:

1. Economics by Samuelson

2. Economics by John Sloman
3. Economic Development by Michael Todaro

Hum 307: Government

3.00 Contact Hour 3.00 Credit Hour

Scope; Some fundamental concepts of government and politics; Origin of the state; Stages of development of modern state: nation, nationalism, internationalism; Sovereignty: dejure and de-facto sovereignty; Functions of state: individualism, socialism, welfare state, fascism.

Citizenship: rights, duties; Hindrances to good citizenship.

Forms of government: Aristotle's classification, modern classification, democracy, dictatorship, cabinet, presidential, unitary and federal; Organs of government and separation of powers: legislature, executive, judiciary, bureaucracy; The electorate: party system, public opinion.
Local self government.
Socio-political and economic background of the movement for Bangladesh; Government and politics in Bangladesh.

Some major administrative systems; International political organization: the UNO and its specialized agencies.

Text and Ref books:

1. Political Theory – V. D. Mahajan.
2. Principles of Political Sciences – A. C. Kapur.
3. Political Science and Government (9^{th} edition) – Hafis Habibur Rahman, Publisher – Ideal Publication.

SHOP 108: Workshop Technology Sessional – I

1.50 Contact Hour 0.75 Credit Hour

Foundry: Introduction to foundry, hand tools and equipment; Patterns: function, pattern making; Molding: molding materials sand preparation, types of mold, procedure; Cores: types, core making materials; Metal melting and casting; Inspection of casting and casting defects.
Sheet metal working and other operations like cutting, shearing, filling, sawing and contouring; Metal joints: riveting, grooving, soldering, welding; Welding practice: welding processes, electric arc - steel, aluminum; Types of electrode; Welding defects: visual, destructive and non-destructive tests of welding. Gas welding and equipment; Types of flame, flame cutting; Welding of different types of materials; Gas welding defects; Test of gas welding; Welding of aircraft materials.

Text and Ref books:

1. Machine Shop Practice – James Anderson; W. A. Chapman.
2. Shop Theory –Anderson & Tatro.

SHOP 112: Workshop Technology Sessional -II

1.50 Contact Hour 0.75 Credit Hour

Tools: common bench and hand tools, holding tools, hammers, cutting tool materials, cutting tool shapes, marking and layout tools, measuring tools, cutting tools, machine tools, Bench work on jobs; Practices on machine tools: drilling machine, lathe machine, shaper machine, milling machine, grinding machine, bending, deburring and finishing operations and contour-cutter machines. Discuss operations like turning, tapering, boring, drilling, threading and gear cutting; Indexing operations and various types of indexing on milling machines.

Introduction to composite materials, plastics, ceramics, and adhesives etc.

NC and CNC-machining; Principles and programming basics.

Text and Ref books:

1. Machine Shop Practice – James Anderson, W. A. Chapman.
2. Shop Theory – Anderson & Tatro.

CHAPTER 7

DETAIL OUTLINE OF UNDERGRADUATE COURSES OFFERED BY AE DEPARTMENTS TO ME STUDENTS

AEAS 449: Aerodynamics

3.00 Contact Hour 3.00 Credit Hour

Inviscid incompressible flow to include potential function, stream function, circulation and basic flows; Kutta-Joukowski theorem; Aerofoil theory and wing theory.

Drag, aircraft propulsion and propeller; Static performance problem; Special performance problem; Introduction to stability and control; Longitudinal stability and control; Lateral and directional stability and control.

Text and Ref books:

1. Aircraft Performance: Theory and Practice – M. E. Eshelby, M. Eshelby, Publisher – AIAA (American Institute of Aeronautic and Astronautics), 1991.
2. Fundamentals of Aerodynamics – John D. Anderson, Publisher – Mc Graw-Hill, 3rd edition, 2001.
3. Mechanics of Flight – Warren F. Phillips, Publisher Wiley, 2004.
4. Foundations of Aerodynamics: Bases of Aerodynamics Design – Arnold M. Kuethe, Chuess-yen chow, Publisher – Wiley, 5th edition, 1997.
5. Illustrated Guide to Aerodynamics – Hubert C. Smith, Publisher – Mc Graw-Hill Professional, 2nd edition, 1991.
6. Aerodynamics – L J Clancy, Publisher – Himalayan Books.

AEAS 451: Aircraft and Aero-engine Structure

3.00 Contact Hour 3.00 Credit Hour

Aircraft structure: introduction, fuselage, wing, control surfaces and landing gear; Structural elements of wing and fuselage; Constructional features of wing.

Helicopter structure: introduction, main rotor, tail rotor, free wheel unit; power transmission; Main gearbox.
Aero-engine structure: Types of aero-engine, intake, compressor, combustion chamber, turbine, exhaust, after burner; Selection of materials for aircraft and aero-engine.

Text and Ref books:

1. Aircraft gas turbine Engine Technology – I E Treager, Publisher – Purduke University. AP - 3456B
2. Airframe and Power Plant – C A Zweng, Publisher - Galotia Publications.
3. Janes all the world's Aircraft Taylor WR (2002-03) – Barr and Isroud.
4. Aircraft Structure – David & Perez, Publisher – Mc Graw-Hill.
5. Introduction to Aerospace structural Analysis–David H Allen, Publisher–Weley & Sons.
6. Jet Aircraft Power System (3rd edition) – Jack VC, Publisher – Mc Graw- Hill.
7. Engine the Search for Power – John Day, Publisher – Hamlyn London

AEAS 453: Applied Aerodynamics

3.00 Contact Hour 3.00 Credit Hour

Aircraft: Basic structure of ac. Basic forces act on ac.

Atmosphere: Temperature changes in atmosphere; Effect of temperature, pressure and density with change of altitude; International standard atmosphere; Local & free stream characteristics; Atmospheric layers; Air Speed & Ground speed.

Air Flow : Dimensional analysis; Reynolds Number; Wind tunnel and scale effect; Rayleigh's formula, Equation of Continuity, Bernoulli's theorem, venturi tube; Boundary layer: Laminar and turbulent flow; Circulation and Generation of lift; Static and Dynamic Pressure; Air Operated Instruments : Pilot Static tube; Principle of altimeter; Measurement of Air Speed; IAS, RAS, EAS and TAS; Position Error.

Aerofoil Terminology : Different Shapes of aerofoils, Definitions : Chord, Camber, Angle of Attack, Aspect Ratio, Taper wing; Lift; Air flow and pressure distribution over aerofoil, Pitching moment; Centre of pressure and Aerodynamic centre; Drag; Types of Drag - Form Drag, Skin Friction drag, Induced Drag; Aerofoil characteristics : Lift Curve, Drag Curve, Lift/Drag ratio curve; Aircraft Controls and high lift devices.

Performance: Minimum drag curves; Power Curves; Ceiling; Flight envelope, Stability and control; Static and dynamic stability.

Maneuvers : Different types of wings and their effect ; Effect of Tail plane; Take off and Landing; Climbing and Gliding; Turning, loops, spins, inverted flying;

Transonic Speeds: Introduction to Transonic, supersonic and Hypersonic speed; Propagation of wave; Mack cone; Formation of shock wave.

Text and Ref books:

1. Mechanics of flight – Kermode, Publisher - A C Wheeler and Co.
2. Aerodynamics – L J Chancy, Longnan.
3. AP - 3456A
4. Theoretical Aerodynamics – Thomson L MM, Publisher – Mac Millan.
5. The Aerodynamic design of Aircraft – D Kucheman, Publisher – Pergamon Press.
6. Higher approximation in Aerodynamic Theory – M J Light Hill, Publisher – Poinaton University.
7. High Speed Wing theory – R. T Jones, Publisher – Princeton University.

AEAS 455: Aircraft stability and control and Aircraft systems

3.00 Contact Hour 3.00 Credit Hour

Systematic account of Aircraft Stability and Control. This includes the Static Longitudinal, Directional and Lateral stability with respect to the aircraft axis systems. Effect of various wings design and secondary control surfaces.

The Aircraft system includes; A/C System in general, Hydraulic system, Pneumatic system, Flight control system, Landing gears system, fuel system, Cockpit pressurization & air-conditioning system, Speed brake and thrust reversal, anti-icing system, electrical system, flight instruments, life saving equipment.

Text and Ref books:

1. Aircraft dynamic stability and response – A W Babister, Publisher – Pergamon Press.
2. Airplane Performance stability and control – CD Perking.
3. Aero Structures – N I Hoff, Publisher – Pergamon Press.
4. Aircraft design a conceptual Approach – Daniel. P. Paymek, AIAA.