



**HINDUSTAN
UNIVERSITY**

HINDUSTAN INSTITUTE OF TECHNOLOGY & SCIENCE

(Estd. u/s 3 of the UGC Act, 1956)

Padur, Kancheepuram District - 603 103.

SCHOOL OF AERONAUTICAL SCIENCES

**Regulations Curriculum
and Syllabus
2013**

**M.Tech.
AIRCRAFT MAINTENANCE
ENGINEERING**

ACADEMIC REGULATIONS
(M.TECH./ M.B.A. / M.C.A.) (Full - Time / Part - Time)
(Effective 2013-14)

1. Vision, Mission and Objectives

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

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

1.2 Further, the institute always strives

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

1.3 Our aims and objectives are focused on

- Providing world class education in engineering, technology, applied science and management.

- Keeping pace with the ever changing technological scenario to help our students to gain proper direction to emerge as competent professionals fully aware of their commitment to the society and nation.
- To inculcate a flair for research, development and entrepreneurship.

2. Admission

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

2.2 The selected candidates will be admitted to the (M.TECH / M.B.A. / M.C.A.) programme after he/she fulfills all the admission requirements set by the Institute and after payment of the prescribed fees.

2.3 Candidates for admission to the first semester of the Master's Degree Programme shall be required to have passed an appropriate Degree Examination recognized by Hindustan University.

2.4 In all matters relating to admission to the (M.TECH / M.B.A. / M.C.A.). Programme, the decision of the Institute and its interpretation given by the Chancellor of the Institute shall be final.

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

3. Structure of the programme

3.1 The programme of instruction will have the following structure

- i) Core courses of Engineering / Technology / Management.
- ii) Elective courses for specialization in areas of student's choice

3.2 The minimum durations of the programmes are as given below:

Program	No. of Semesters
M.Tech.(Full-Time)	4
M.Tech.(Part -Time)	6
M.B.A. (Full - Time)	4
M.B.A. (Part - Time)	6
M.C.A.(Full - Time)	6
M.C.A.(Part-Time)	8

Every (M.TECH / M.B.A. / M.C.A.) programme will have a curriculum and syllabi for the courses approved by the Academic Council.

3.3 Each course is normally assigned certain number of credits. The following norms will generally be followed in assigning credits for courses.

- One credit for each lecture hour per week per semester
- One credit for each tutorial hour per week per semester

- One credit for each laboratory practical of three hours per week per semester.
- One credit for 4 weeks of industrial training and
- One credit for 2 hours of project per week per semester.

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

Program	Minimum prescribed credit range
M.Tech. (Full time / Part time)	75 - 85
M.B.A. (Full time / Part time)	85 - 95
M.C.A (Full time / Part time)	115 - 125

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

4. Faculty Advisor

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

5. Class Committee

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

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

- (ii) All subject teachers of the class.
- (iii) Two students nominated by the department in consultation with the class.

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

The functions of the Class Committee will include:

- (i) Addressing problems experienced by students in the classroom and the laboratories.
- (ii) Analyzing the performance of the students of the class after each test and finding ways and means of addressing problems, if any.
- (iii) During the meetings, the student members shall express the opinions and suggestions of the class students to improve the teaching / learning process.

6. Grading

6.1 A grading system as below will be adhered to.

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

6.2 GPA & CGPA

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

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

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

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

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

7. Registration and Enrollment

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

7.2 A student will be eligible for enrollment only if he/she satisfies regulation 10 (maximum duration of the programme) and will be permitted to enroll if (i) he/she has cleared all dues in the Institute, Hostel & Library up to the end of the

previous semester and (ii) he/she is not debarred from enrollment by a disciplinary action of the University.

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

8. Registration requirement

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

8.1 (ii) A part time student shall not register for less than 10 credits or more than 20 credits in any given semester.

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

9. Minimum requirement to continue the programme

9.1 For those students who have not earned the minimum required credit prescribed for that particular semester examination, a warning letter to the concerned student and also to his parents regarding the shortage of his credit will be sent by the HOD after the announcement of the results of the university examinations.

10. Maximum duration of the programme

The minimum and maximum period for the completion of various programs are given below.

Program	Min. No. of Semesters	Max. No. of Semesters
M.Tech (Full - time)	4	8
M.Tech (Part - time)	6	10
M.B.A. (Full Time)	4	8
M.B.A. (Part Time)	6	10
M.C.A. (Full - Time)	6	12
M.C.A (Part -Time)	8	14

11. Temporary discontinuation

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

12. Discipline

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

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

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

13. Attendance

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

13.2 Those who have less than 75% attendance will be considered for condonation of shortage of attendance. However a condonation of 10% in attendance will be given on medical reasons. Application for condonation recommended by the Faculty Advisor, concerned faculty member and the HOD is to be submitted to the Director (Academic) who, depending on the merits of the case, may permit the student to appear for the end semester examination. A student will be eligible for this concession at most in two semesters during the entire degree programme. Application for medical leave, supported by medical certificate with endorsement by a Registered Medical Officer, should reach the HOD within seven days after returning from leave or, on or before the last instructional day of the semester, whichever is earlier.

13.3 As an incentive to those students who are involved in extra curricular activities such as representing the University in Sports and Games, Cultural Festivals, and Technical Festivals, NCC/ NSS events, a relaxation of up to 10% attendance will be given subject to the

condition that these students take prior approval from the officer-in-charge. All such applications should be recommended by the concerned HOD and forwarded to Director (Academic) within seven instructional days after the programme/activity.

14. Assessment Procedure

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

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

Test / Exam	Weightage	Duration of Test Exam
First Periodical Test*	10%	2 Periods
Second Periodical Test*	10%	2 Periods
Model exam	20%	3 hours
Seminar/ Assignments/Quiz	20%	
End - semester examination	50%	3 Hours

* Best out of the two tests will be considered.

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

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

15. Make up Examination/model examination

15.1 Students who miss the end-semester examinations / model examination for valid reasons are eligible for make-up examination /model examination. Those

who miss the end-semester examination / model examination should apply to the Head of the Department concerned within five days after he / she missed examination, giving reasons for absence.

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

16. Project evaluation

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

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

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

17. Declaration of results

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

- 17.2** After the valuation of the answer scripts, the tabulated results are to be scrutinized by the Result Passing Boards of PG programmes constituted by the Vice-Chancellor. The recommendations of the Result Passing Boards will be placed before the Standing Sub Committee of the Academic Council constituted by the Chancellor for scrutiny. The minutes of the Standing Sub Committee along with the results are to be placed before the Vice-Chancellor for approval. After getting the approval of the Vice-Chancellor, the results will be published by the Controller of Examination/ Registrar.

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

- 17.4** If a candidate fails to secure a pass in a course due to insufficient sessional marks though meeting the minimum requirements of the end semester examination, wishes to improve on his/ her sessional marks, he/she will have to register for the particular course and

attend the course with permission of the HOD concerned and the Registrar. The sessional and external marks obtained by the candidate in this case will replace the earlier result.

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

17.6 The weightage for internal marks in finalizing results and grades shall be waived off after completion of 5 semesters.

18. Grade Card

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

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

19. Class / Division

19.1 Classification is based on CGPA and is as follows:

- CGPA \geq 8.0 : **First Class with distinction**
- 6.5 \leq CGPA < 8.0 : **First Class**
- 5.0 \leq CGPA < 6.5 : **Second Class.**

19.2 (i) Further, the award of 'First class with distinction' is subject to the candidate becoming eligible for the award of the degree having passed the examination in all the courses in his/her first appearance within the minimum duration of the programme.

(ii) The award of 'First Class' is further subject to the candidate becoming eligible to the award of the degree having passed the examination in all the courses within the below mentioned duration of the programme.

Program	No. of Semesters
M.Tech.(Full-Time)	5
M.Tech.(Part -Time)	7
M.B.A. (Full - Time)	5
M.B.A. (Part - Time)	7
M.C.A.(Full - Time)	7
M.C.A.(Part -Time)	9

(iii) The period of authorized discontinuation of the programme (vide clause 11.1) will not be counted for the purpose of the above classification.

20. Transfer of credits

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

21. Eligibility for the award of (M.TECH / M.B.A. / M.C.A.) Degree

21.1 A student will be declared to be eligible for the award of the (M.TECH / M.B.A. / M.C.A.). Degree if he/she has

- i) registered and successfully credited all the core courses,
- ii) successfully acquired the credits in the different categories as specified in the curriculum corresponding to the discipline (branch) of his/her study within the stipulated time,
- iii) has no dues to all sections of the Institute including Hostels, and

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

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

22. Power to modify

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

**HINDUSTAN UNIVERSITY
HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE
SCHOOL OF AERONAUTICAL SCIENCES
M.TECH. AIRCRAFT MAINTENANCE ENGINEERING**

OBJECTIVES OF THE PROGRAMME

- To educate the students in the fundamentals of engineering, science and their applications to important practical problems using design, analysis and synthesis of aircraft's components, systems and tools through basic and advance research.
- To inspire our students to pursue a life of curiosity and desire for learning and to instill in them the ability and self confidence to adapt rapid and major changes.
- To develop leadership skills in our students necessary to shape the social, intellectual, business and technical worlds.

PROGRAMME OUTCOME

- The student will have the ability to apply knowledge of engineering, science and mathematics to design and conduct experiments in the field of Aircraft Maintenance Engineering.
- The students will have the ability to design a system, component or process to meet desired needs and to function on multidisciplinary teams.
- The students will become a professional engineer with all necessary skills, personality and sound knowledge in basic and advance research areas.

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SCHOOL OF AERONAUTICAL SCIENCES

M.TECH. AIRCRAFT MAINTENANCE ENGINEERING

SEMESTER I

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
Theory							
1.	PMA103	Probability and Statistics	3	1	0	4	4
2.	PAM101	Mechanics of Flight	3	1	0	4	4
3.	PAM102	Aircraft General Engineering Maintenance Practices	3	1	0	4	4
4.	PAM 103	Civil Aviation Requirements - I	3	1	0	4	4
5.	PAM104	Aircraft Systems and Instrumentations	3	1	0	4	4
6.	PAM105	Avionics	3	1	0	4	4
PRACTICAL							
7.	PAM 106	Non-Destructive Testing Laboratory (New)	0	0	2	1	2
		TOTAL				25	26

SEMESTER II

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
Theory							
1.	PAM107	Maintenance and Reliability Engineering	3	1	0	4	4
2.	PAM108	Airframe Maintenance and Repair	3	0	2	4	5
3.	PAM109	Aero Engine Maintenance and Repair	3	0	2	4	5
4.	PAM110	Aircraft Composite Structures and Repair (NEW)	3	0	2	4	5
5.	PAE107	Aircraft and Systems - Industry Perspective*	3	1	0	4	4
6.	PAT101	Airlines and Airport Management	3	0	0	3	3
PRACTICAL							
7.	PAE1641	Aero Engine Laboratory	0	0	2	1	2
		TOTAL				24	28

* Common to M.Tech. Aeronautical Engineering

SEMESTER III

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
Theory							
1.	PAM112	Aircraft Maintenance Management	3	0	0	3	3
2.	PAM113	Civil Aviation Requirements - II	3	1	0	4	4
3.	E1	Elective - I	3	0	0	3	3
PRACTICAL							
4.	PAE113**	Aircraft Systems Laboratory	0	0	3	1	3
5.	PAM114	Project Work - Phase I	0	0	12	6	12
		TOTAL				17	25

** -Common to M.Tech. Aeronautical Engineering

SEMESTER IV

Sl. No.	Course Code	Course Title	L	T	P	C	TCH
Practical							
1.	PAM115	Project Work - Phase II	0	0	24	12	24
		TOTAL				12	24

Total No. of Credits: 78

ELECTIVE COURSES
SEMESTER - III

Sl.No	Course Code	Course Title	L	T	P	C	TCH
1.	PAM701	Airlines Operation and Scheduling	3	0	0	3	3
2.	PAM702	Diagnostic Techniques	3	0	0	3	3
3.	PAT102	Airline Marketing Management	3	0	0	3	3
4.	PAM703	Helicopter Maintenance	3	0	0	3	3
5.	PAM704	Aircraft Navigation Systems	3	0	0	3	3
6.	PBA302	Entrepreneurship Development	3	0	0	3	3
7.	PAM705	Aviation safety management	3	0	0	3	3
8.	PAM706	System Simulation And Modeling	3	0	0	3	3
9.	PAM707	Advanced optimization techniques	3	0	0	3	3
10.	PAM708	Logistics and supply chain management	3	0	0	3	3

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M.TECH. AIRCRAFT MAINTENANCE ENGINEERING**

PMA103 PROBABILITY AND STATISTICS

**L T P C
3 1 0 4**

GOAL

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

OBJECTIVES

The course should help the students to

1. Enable the random variables moments.
2. Enrich idea about the correlation and regression.
3. Provide the details about the testing of hypothesis methods.
4. Provide the details about the design of experiments.
5. Enrich idea about the time series

OUTCOMES

The students should be able to

1. Understand the random variables, correlation and regression.
2. Understand the correlation and regression.
3. Have understood different types of hypothesis testing.
4. Have understood randomised design.
5. Understand the Exponential smoothing - Auto Regressive Processes

UNIT I PROBABILITY AND RANDOM VARIABLE 12

Probability - Random variables - Moments - Moment generating function - Standard distributions - Functions of random variables - Two-dimensional R.Vs - Correlation and Regression.

UNIT II ESTIMATION THEORY 12

Principle of least squares - Regression - Multiple and Partial correlations - Estimation of Parameters - Maximum likelihood estimates - Method of moments.

UNIT III TESTING OF HYPOTHESIS 12

Sampling distributions - Test based on Normal, t-distribution, chi-square, and F-distributions - Analysis of variance - One-way and two way classifications.

UNIT IV DESIGN OF EXPERIMENTS**12**

Completely Randomized Design - Randomized Block Design - Latin Square Design - 2 Factorial Design.

UNIT V TIME SERIES**12**

Characteristics and Representation - Moving averages - Exponential smoothing - Auto Regressive Processes.

TOTAL: 60**TEXT BOOKS**

1. Freund John, E and Miller, Irvin, "Probability and Statistics for Engineering", 5th Edition, Prentice Hall, 1994.
2. Jay, L.Devore, "Probability and Statistics for Engineering and Sciences", Brooks Cole Publishing Company, Monterey, California, 1982.

REFERENCES

1. Montgomery D.C and Johnson, L.A, "Forecasting and Time series", McGraw Hill.
2. Anderson, O.D, "Time series Analysis: Theory and Practice", I.North-Holland, Amsterdam, 1982.
3. Gupta, S.C and Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, New Delhi, 1999.

PAM101 MECHANICS OF FLIGHT

L	T	P	C
3	1	0	4

GOAL

To introduce the basic concept of aeronautical engineering and the current development in the field

OBJECTIVES

Impart the students to

1. Enable knowledge about the aircraft components and flight controls.
2. Enrich idea about the propulsion system.
3. Provide the details about the aerodynamics
4. Enrich idea about the stability and control
5. Provide the details about the aircraft structure

OUTCOMES

The student will be able to

1. Understand about the flight control and components.
2. Understand the rocket propulsion and working principle

3. Have understood about the theory of flight.
4. Have understood about the aircraft performance
5. Have understood about the structural design parameter

UNIT I CONFIGURATION OF AIRPLANE AND ITS COMPONENTS 12

How an Airplane flies - components of an airplane and their functions - motions of airplane -Pitching, Rolling and Yawing-Banking, skidding and slipping - starting, taxiing - Take-off - landing - stalling, spinning, spirals - cross wind take-off and landings. Different types of flight vehicles.

UNIT II PROPULSION 12

Aircraft propulsion, Rocket propulsion, power plant classification, principles of Operation and areas of their application.

UNIT III AERODYNAMICS 12

Airfoils and streamlines bodies - forces acting on an airplane - lift and drag - speed and power - physical properties and structure of atmosphere - theory of flight.

UNIT IV STABILITY AND CONTROL 12

Introduction to stability and control, Concepts of static and dynamic stability and control, dynamic instability and control, V-n diagram, range and endurance.

UNIT V AIRCRAFT STRUCTURES 12

Introduction to Aircraft structures - Loads - Types of construction - Design features Aircraft materials.

TOTAL: 60

TEXT BOOKS

1. Kermode, A.C, "Mechanics of Flight" English Book Store, New Delhi, 1992.
2. John.D.Anderson.Jr, "Intoduction to flight" TATA McGraw-Hill,2007

REFERENCES

1. Van Sickle Neil, D "Modern Airmanship" VanNostrand Reinhol, New York, 1985.
2. Megson T.H. "Aircraft Structures for Engineering Students", II Edition, Edward Arnold, Kent, U.S.A. 1990.

PAM102 AIRCRAFT GENERAL ENGINEERING & MAINTENANCE PRACTICES

L T P C
3 1 0 4

GOAL

To teach the students about the basic concept of Aircraft general engineering and maintenance practices.

OBJECTIVES

The course should help the students to

1. Enable knowledge about the aircraft maintenance practices
2. Enrich idea about the aircraft tools
3. Provide the details about the aircraft materials
4. Enrich idea about the NDT and welding
5. Provide the details about the electrical related systems.

OUTCOMES

The students should be able to

1. Understand about the tools and maintenance practices
2. Understand the aircraft fastening devices and bearing
3. Have understood about the composites and aircraft materials
4. Have understood about the NDT methods and welding techniques
5. Have understood about the Electrical Cables and Connectors , Weight and Balance Control

UNIT I AIRCRAFT MAINTENANCE PRACTICES 12

Standard Maintenance Practices - Aircraft Maintenance Practices - General Purpose Tools - Measuring Tools - Torque Wrenches and Torque Loading Practices

UNIT II TOOLS 10

Aircraft Fastening Devices - Bolts ,Screws, Nuts and Washers, Locking Devices and Springs, Engineering Drawings and Diagrams, Bearings and Gears.

UNIT III AIRCRAFT MATERIALS 14

Aircraft Materials - Ferrous, Non-Ferrous ,Composite and Non-Metallic Materials Corrosion ,Corrosion Control and Protection Techniques

UNIT IV NON-DESTRUCTIVE TESTING (NDT) AND WELDING 14

Various Non-Destructive Testing Techniques,Dye Penetrant,Magnetic Particle, Radiography, Ultrasonic, Eddy Current,etc,. Various welding procedures and techniques used in aircraft and case studies.

UNIT V AIRCRAFT MISCELLANEOUS

10

Electrical Cables and Connectors, Usage of Electrical Instruments and Equipment, Testing and Calibration Methods, Pipes, Hoses and Control Cables, Aircraft Weight and Balance Control, Quality System and Procedures.

TOTAL: 60

TEXT BOOKS

1. "Civil Aircraft Inspection Procedures" (CAP 459-Part I, Basic)
2. "Airframe & Powerplant Mechanics" (General Handbook EA-AC 65-9A)
3. "Shop Theory" by James Anderson Earl E. Tatro, 2005.

REFERENCES

1. "Training Manual General Section Book 1 thru 7" by Dale Crane, 2000
2. "Aircraft Materials & Processes" by Titterton. 2004.
3. "Machine Drawing" by AC Parkinsons, 2006.
4. "Advanced Composites (EA-358)" by Cindy Foreman, 2004
5. "Digital Fundamentals" by Malvino and Leech, 2002.
6. "Standard Aviation Maintenance Handbook EA-282-0", 2000.
7. "Standard Aircraft Handbook" (5th Edition) -Larry Reithmaier, 2002.

PAM103 CIVIL AVIATION REQUIREMENTS - I

L	T	P	C
3	1	0	4

GOAL

To teach civil aviation rules and regulations which are being followed by Directorate General of Civil Aviation

OBJECTIVES

The course should help the students to

1. Enable knowledge about Indian aviation rules
2. Enrich idea about the airworthiness series A and B
3. Provide the details about the airworthiness series C and D
4. Enrich idea about the series E
5. Provide the details about the series F

OUTCOMES

The student will

1. Be able to understand about the Indian rules and related acts.
2. Be able to understand CAR series A and B, about ownership and MEL.
3. Have understood about the CAR series C and D, about defect and maintenances programme
4. Have understood about the Series E - approval of organisation.
5. Have understood about the Series F - continued airworthiness

UNIT I INDIAN AIRCRAFT RULES 1937 AND RELATED PUBLICATIONS 7

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

UNIT II C.A.R. SERIES A - PROCEDURE FOR ISSUE OF CIVIL AIRWORTHINESS REQUIREMENTS AND RESPONSIBILITY OF OPERATORS VIS-À-VIS AIR WORTHINESS DIRECTORATE 11

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

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

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

UNIT III C.A.R. SERIES 'C' - DEFECT RECORDING, MONITORING, INVESTIGATION AND REPORTING 11

Defect recording, reporting, investigation, rectification and analysis; flight report, recording of in-flight instrument, reading and reporting of flight defects and rectification of defects observed on aircraft.

C.A.R. series 'D' - and aircraft maintenance programmes

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

UNIT IV C.A.R. SERIES E - APPROVAL OF ORGANIZATIONS 13

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

UNIT V C.A.R. SERIES "F" AIRWORTHINESS AND CONTINUED AIRWORTHINESS 18

Procedure relating to registration of aircraft; procedure for issue / revalidation of type certification of aircraft and its engines / propellers; issue /revalidation and renewal of certificate of airworthiness; requirement for renewal of certificate of airworthiness. Suspensions of certificate of airworthiness and its subsequent revalidation.

TOTAL: 60

TEXT BOOKS

1. "Aircraft manual (India) volume" - latest edition, the English book store, 17-l, Connaught circus, New Delhi. 2000.
2. "Civil aviation requirements with latest amendment (section 2 airworthiness)" - published by DGCA, the English book store, 17-l, Connaught circus, New Delhi.
3. "Aeronautical information circulars (relating to airworthiness)" from DGCA.2009. Advisory circulars from DGCA,2009.

PAM104 AIRCRAFT SYSTEMS AND INSTRUMENTATIONS

L	T	P	C
3	1	0	4

GOAL

To describe the principle and working of Aircraft systems and Instruments

OBJECTIVES

The course should enable the students to

1. Knowledge about airplane control systems
2. Enrich idea about the aircraft systems
3. Provide the details about the engine systems
4. Enrich idea about the aircraft auxiliary systems
5. Provide the details about the aircraft instruments

OUTCOMES

The students should be able to

1. Understand about the flight controls and communication & Navigation systems
2. Understand about the hydraulic and pneumatic systems.
3. Have understood about the piston and jet engine systems
4. Have understood about the oxygen, icing system
5. Have understood about the Flight and Navigation
6. Instruments and engine instruments

UNIT I AIRPLANE CONTROL SYSTEMS

18

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

UNIT II AIRCRAFT SYSTEMS**10**

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

UNIT III ENGINE SYSTEMS**11**

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

UNIT IV AUXILLIARY SYSTEM**11**

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

UNIT V AIRCRAFT INSTRUMENTS**10**

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

TOTAL: 60**TEXT BOOKS**

1. McKinley, J.L., and Bent, R.D., "Aircraft Maintenance & Repair", McGraw-Hill, 1993.
2. "General Hand Books of Airframe and Powerplant Mechanics", U.S. Dept. of Transportation, Federal Aviation Administration, The English Book Store, New Delhi 1995.

REFERENCES

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

PAM105 AVIONICS

L T P C
3 1 0 4

GOAL

To know the role of electronics in aviation field

OBJECTIVES

The course should enable the students to

1. Knowledge about basic avionics and its system
2. Enrich idea about the aircraft avionics displays
3. Provide the details about the data bus
4. Enrich idea about the system assessment
5. Provide the details about the avionics maintenance and cost

OUTCOMES

The students will be able to

1. Understand about the avionics system, its role and architecture.
2. Understand about the display, input output devices and power required.
3. Have understood about the data bus design and integration
4. Have understood about the certification, Assessment and Validation.
5. Have understood about the maintenance and cost for it.

UNIT I INTRODUCTION TO AVIONICS

7

Role for Avionics in Civil and Military Aircraft systems, Avionics sub-systems and design, Avionics System/subsystem requirements-Importance of avionics system architectures.

UNIT II AVIONICS SYSTEM ESSENTIALS: DISPLAYS, I/O DEVICES AND POWER

14

Trends in display technology, Alphanumeric displays, character displays etc., Civil and Military aircraft cockpits, MFDs, MFK, HUD, HDD, HMD, DVI, HOTAS, Synthetic and enhanced vision, situation awareness, Panoramic/big picture display, virtual cockpit-Civil and Military Electrical Power requirement standards, comparing the Military and Civil Requirements and Tips for Power System Design

UNIT III AVIONICS SYSTEM DATA BUSES, DESIGN AND INTEGRATION

16

MIL-STD-1553B, ARINC-429, ARINC-629, CSDB, AFDX and its Elements, Avionics system design, Development and integration-Use of simulation tools, stand alone and integrated Verification and Validation

UNIT IV SYSTEM ASSESSMENT, VALIDATION AND CERTIFICATION

16

Fault tolerant systems and Hardware and Software, Evaluating system design and Future architecture Hardware assessment-FARs guide certification requirements-Fault Tree analysis -Failure mode and

effects analysis, Criticality and damaging modes and effects analysis, Software development process models, Software Assessment and Validation -Civil and Military standards, Certification of Civil Avionics

UNIT IV MAINTENANCE AND COSTS OF AVIONICS

7

BIT and CFDS, Automatic Test Equipment, Speeds maintenance, ATLAS, Remote diagnostics and maintenance support-Life Cycle Costs for Military and Civil Avionics, Cash flow analysis, Software costs, Establishing spares level

TOTAL: 60

TEXT BOOKS

1. Spitzer, C.R. "Digital Avionics Systems", Prentice Hall, Englewood Cliffs, N.J., U.S.A., 1987
2. Cary R .Spitzer, "The Avionics Handbook", Crc Press, 2000

REFERENCES

1. Collinson R.P.G "Introduction to Avionics", Chapman and Hall, 1996
2. Middleton, D.H. "Avionics Systems", Longman Scientific and Technical, Longman Group UK Ltd., England, 1989.
3. Jim Curren, "Trend in Advanced Avionics", IOWA State University, 1992.

PAM106 NON-DESTRUCTIVE TESTING LABORATORY

L	T	P	C
0	0	2	1

GOAL

To introduce the knowledge about the Non-destructive testing in detail to identify the cracks on the materials

OBJECTIVES

The course should help the students to

1. Enable knowledge ultrasonic testing
2. Enrich idea about the Eddy current testing
3. Provide the details about Dye-penetrant Testing
4. Enrich idea about the Magnetic Particle Inspection
5. Provide the details about the defectoscope

OUTCOMES

The students should be able to

1. Understand about the working of ultrasonic testing machine
2. Understand about the working of Eddy current testing machine

3. Have understood about the working of Dye- penetrant Testing machine
4. Have understood about the working of Magnetic Particle Inspection machine
5. Have understood about the working of defectoscope machine.

LIST OF EXPERIMENTS

1. Ultrasonic Testing
2. Eddy current testing
3. Dye penetrant testing
4. Magnetic particle inspection on Airframe
5. Magnetic particle inspection on Aero Engines
6. Defectoscope

LIST OF EQUIPMENTS

(For a batch of 30 students)

Sl. No	Equipments	Qty	Experiments No.
1	Ultrasonic Testing	1	1
2	Eddy current testing	1	2
3	Dyepenetrant Testing	1	3
4	Magnetic Particle Inspection	1	4,5
5	Defectoscope	1	6

SEMESTER - II

PAM107 MAINTENANCE AND RELIABILITY ENGINEERING

L	T	P	C
3	1	0	4

GOAL

To introduce the concepts of reliability and diagnostic maintenance techniques

OBJECTIVES

The course should enable the students to

1. Knowledge about maintenance management
2. Enrich idea about the types of maintenance.
3. Provide the details about the diagnostic maintenance
4. Enrich idea about the concept of reliability
5. Provide the details about design of reliability

OUTCOMES

The students should be able to

1. Understand about the objective and concepts in maintenance management.
2. Understand about the types, advantages and limitations of maintenance
3. Have understood about the types of different diagnostic maintenance.
4. Have understood about the methodology and calculating methods.
5. Have understood about different analysis methods.

UNIT I MAINTENANCE MANAGEMENT

12

Need for maintenance-Objective- Concepts-Types of maintenance-Organization-Trade force mix, type and location-Maintenance costs-Benefits-Computer Aided Maintenance management-Total productive maintenance.

UNIT II TYPES OF MAINTENANCE

10

Breakdown and Preventive maintenance-Advantages and Limitations-Maintenance prevention-Diagnostic maintenance-Design out maintenance-Opportunity maintenance.

UNIT III DIAGNOSTIC MAINTENANCE

12

Leak detection-wear monitoring-Temperature monitoring-Vibration monitoring-Signature analysis-Shock monitoring-Lubricant-Analysis-Methodology-Equipments-Applications

UNIT IV CONCEPTS OF RELIABILITY

14

Elements of Probability-Reliability Definition-Measures of Reliability-Failures-Classification of failures-Failure data analysis-Availability-Criticality matrix-Event tree analysis-Utilization factor-Factors affecting reliability.

UNIT V DESIGN FOR RELIABILITY

12

Analysis of reliability data-Weibull analysis-Design and manufacture for Reliability-Reliability of parts and components-Design for system reliability-Economics of standby or redundancy in a production system-reliability testing-Types.

TOTAL: 60

TEXT BOOKS

1. HIGGINS and MORROW, -" Maintenance Engineering Handbook ", Tata McGraw Hill, 1985.
2. COLLECT, " Mechanical Fault Diagnosis and Condition monitoring " - McGraw Hill-1985.
3. MILLER & BLOOD .- " Modern maintenance Management " -Tarapooriwala & sons, 1976.

REFERENCES

1. JENTRY EJ and KUMAMOTO,H, " Reliability Engineering and Test assessment ", Prentice Hall, 1992.
2. CARTER,A.D.S. "Mechanical Reliability ",-Macmillan, 1984.
3. NAKAJIMA.S.. , "Introduction to TPM - Total Productive Maintenance", Productivity Press-1995.
4. O'CONNOR,P.D.T', " Practical Reliability Engineering ", John Wiley-1994.
5. KELLEY.A.& M.J.HARRIS,-" Management of Industrial Maintenance" , Newnes-Butter worth.

PAM108 AIRFRAME MAINTENANCE & REPAIR PRACTICES

L	T	P	C
3	0	1	4

GOAL

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

OBJECTIVE

The course should enable the students to

1. Understand the basic steps in welding and soldering, brazing of aircraft components
2. Depict the composite and plastic components maintenance in aircraft industry
3. Gain knowledge about rigging, jacking of aircraft in maintenance hangar. To explain the steps involved in the maintenance process
4. Know about Hydraulic and Pneumatic system.
5. Understand the safety practices in aircraft maintenance and equipment handling

OUTCOME

The students should be able to

1. Explain the welding, brazing process with the requirements of the process and significance of NDT

2. Understand the various maintenance practices in plastic and composite parts of aircraft
3. Clear in the precautionary steps involved in rigging, jacking process
4. Thorough in parts, working methodology of basic aircraft systems
5. Get a clear idea about safety practices and troubleshooting of an aircraft.

UNIT I WELDING IN AIRCRAFT STRUCTURAL COMPONENTS 13

Equipments used in welding shop and their maintenance - Ensuring quality welds - Welding jigs and fixtures - Engine mount repair -landing gear repair.

SHEET METAL REPAIR AND MAINTENANCE

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

UNIT II PLASTICS AND COMPOSITES IN AIRCRAFT 13

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

Inspection and Repair of composite components - Special precautions - Autoclaves

UNIT III AIRCRAFT JACKING, ASSEMBLY AND RIGGING 11

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

UNIT IV REVIEW OF HYDRAULIC AND PNEUMATIC SYSTEM 13

Trouble shooting and maintenance practices - Service and inspection. - Inspection and maintenance of landing gear systems. - Inspection and maintenance of air-conditioning and pressurization system, water and waste system. Installation and maintenance of Instruments - Handling - Testing - Inspection. Inspection and maintenance of auxiliary systems - Fire protection systems - Ice protection system - Rain removal system - Position and warning system - Auxiliary Power Units (APUs)

UNIT V SAFETY PRACTICES 10

Hazardous materials storage and handling - Aircraft furnishing practices - Equipments - Trouble shooting - Theory and practices.

TOTAL : 60

TEXT BOOK

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

REFERENCES

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

PAM109 AERO ENGINE MAINTENANCE & REPAIR

L T P C
3 0 1 4

GOAL

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

OBJECTIVE

The subject should enable the students to

1. Understand the types of piston engines, principle of operation.
2. Know the inspection, maintenance and troubleshooting procedure of aircraft piston engines
3. Understand the piston engine overhaul procedure and engine testing procedure.
4. Familiarize with 112 types of jet engines and its principle of operations.
5. Understand the maintenance troubleshooting, testing procedure of gas turbine engines.
6. Understand the overhaul procedure of aircrafts gas turbine engines.
7. Familiarize with gas turbine engine, health monitoring and corrective methods.

OUTCOME

The students should be able to

1. Describe the function of each component in piston engines and its materials.
2. Carryout inspections and maintenance checks on aircraft piston engines.
3. Describe the piston engine overhaul procedure.
4. Know the types and function of each component in gas turbine engines.
5. Describe the troubleshooting and rectification procedures of gas turbine engines.
6. Know the overhaul procedures and balancing of gas turbine components.
7. Describe the detail procedure for gas turbine engine, health monitoring.

UNIT I CLASSIFICATION OF PISTON ENGINE COMPONENTS

11

Types of piston engines - Principles of operation - Function of components - Materials used - Details of starting the engines - Details of carburetion and injection systems for small and large engines - Ignition system components - Spark plugs - Engine operating conditions at various altitudes - Maintenance and inspection check to be carried out.

UNIT II INSPECTION OF PISTON ENGINES

12

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

UNIT III OVERHAUL PROCEDURES OF PISTON ENGINES**13**

Symptoms of failure - Fault diagnostics - Case studies of different engine systems - Tools and equipment requirements for various checks and alignment during overhauling - Tools for inspection- destructive testing techniques on engines - Equipment for replacement of part and their repair. Engine testing: Engine testing procedures and schedule preparation - Online maintenance.

UNIT IV CLASSIFICATION OF JET ENGINE COMPONENTS**12**

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

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

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

UNIT V OVERHAUL PROCEDURES OF JET ENGINES**12**

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

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

TOTAL: 60**TEXT BOOK**

1. KROES & WILD, "Aircraft Power plants", 7th Edition - McGraw Hill, New York, 1994.

REFERENCES

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

PAM110 AIRCRAFT COMPOSITE STRUCTURES AND REPAIR

L	T	P	C
3	0	2	4

GOAL

To introduce the concepts of reliability and diagnostic maintenance techniques

OBJECTIVES

The course should help the students to

1. Enable knowledge about introduction to composites
2. Enrich idea about sandwich construction
3. Provide the details about the composite joining
4. Enrich idea about the manufacturing & inspection
5. Provide the details about the repair and application

OUTCOMES

The students should be able to

1. Understand about the fibres, matrix and resin.
2. Understand about the honeycomb in detail
3. Have understood about the types of bonded joints.
4. Have understood about the composite inspection and manufacturing
5. Have understood about repairing methods and its application in aero industry.

UNIT I INTRODUCTION 8

Composite - Classification of Composites - Comparison of composites - Advantages and disadvantages of composite. Fibres - Types of fibres - Matrix- Types of matrices and resin - Prepregs - Prepregs handling.

UNIT II SANWICH CONSTRUCTION 14

Introduction - Face material - Core material - Honeycomb types - Honeycomb Prosperities - Honeycomb Manufacturing - Cell configuration - Adhesive materials - adhesive materials - Design Guidelines - Honeycomb process - Sandwich fabrications - Structural Application - Honeycomb testing - Design aspects - Laminate Lay

UNIT III JOINING OF COMPOSITE 10

Introduction - Mechanically fast and joining - Failure criteria - Bonded joints - Typical joint design - tooling for composite

UNIT IV MANUFACTURING AND INSPECTION OF COMPOSITES 13

Manufacturing Process - Molding Process - Machining of composite material Non-Destructive - NDI Techniques - Type of NDI Techniques.

UNIT V REPAIR AND APPLICATION OF COMPOSITES IN AERO INDUSTRY**15**

Damage Assessment, Evaluation & Classification - Damage Removal - Contamination Treatment - Design consideration - Repair concepts facilities, procedure - Repair Tooling, Options Factor for consideration during prepreg repair - Application of Composite and aircraft industry - Safety Precautions.

TOTAL : 60**TEXT BOOK:**

1. "Advanced Composite Materials" Lalit Gupta, 1st Edition Himalayan Books, 2010.

REFERENCE BOOKS:

1. "Advance Composites" Cindy Foreman, Jeppesen, 2002.
2. "Composite Materials", K.K. Chawla, Springer, 1993, ISBN 10 - 0387964789
3. "Composite Materials : Fabrication Handbook # 1", John Wanberg, Wolfgang productions May 15, 2009.

PAE107 AIRCRAFT AND SYSTEMS - INDUSTRY PERSPECTIVE

L	T	P	C
3	1	0	4

GOAL

To understand the current Aircraft industry, different aircraft systems, materials and airworthiness certifications.

OBJECTIVES

Impart the students to gain knowledge on

1. Aircraft industries and its key players
2. Different Aircraft configurations
3. Various systems in Aircraft
4. Different loads acting on Aircraft
5. Different Aircraft materials used

OUTCOMES

The student will be able to

1. Understand Aircraft industries and its key players
2. Understand different Aircraft configurations
3. Understand various systems in Aircraft
4. Understand different loads acting on Aircraft
5. Understand different Aircraft materials used

UNIT I AIRCRAFT INDUSTRY OVERVIEW**4**

Introduction to Aerospace industry; Types of Aerospace industry, global and Indian aircraft Scenario, Aerospace industry trends.

Keyplayers : Keyplayers in Aerospace Industry, Prime contractors and Tier 1 Suppliers, key challenges in industry supply chain

UNIT II INTRODUCTION TO AIRCRAFTS**4**

Aircraft configuration: Biplane, variable sweep, Canard layout, twin boom layouts, span loaders, blended body wing layout, STOL and STOVL aircraft, stealth aircraft, advantages and disadvantages of these configurations

UNIT III INTRODUCTION TO AIRCRAFT SYSTEMS**8**

Mechanical systems: Environmental control systems(ECS), Engine control systems, Ice and rain protection systems, cabin pressurization and air conditioning systems, steering and brakes systems, auxiliary power unit.

Electrical and Electronic Systems: Autopilot and flight management systems, communication, information systems.

The Interplay of Aerodynamics, Structural Mechanics & Propulsion: Brequet's Range Equation, case study - thrust vectoring

UNIT IV AIRCRAFT LOADS**8**

Introduction : Process and methods, Data requirements, design airspeeds

Loading Scenarios: Symmetric maneuver loads, antisymmetric maneuver loads, ground handling loads, distributed loads calculations, control surface loads, miscellaneous loads, dynamic loads analysis, landing loads, unsymmetric aerodynamics, discrete gust loads, random(PSD) loads analysis, continuous turbulence gust loads, fatigue loads

UNIT V AIRCRAFT MATERIALS**4**

Different materials used in aircraft unit: Aluminum and its alloys: Certification methods of materials allowable (A,B and S basis)

Composite materials: Certification methods of materials allowable

UNIT VI AIRWORTHINESS, CERTIFICATION and STANDARDS**4**

Agencies: Agencies designate for airworthiness such as FAR, CAR, DGCA, CEMILAC, Role of these agencies

Documents and Standards : The intent for documents and standards, Applicable certification for airplanes and helicopters

UNIT VII AIRCRAFT REPAIR**4**

Inspection: Inspection methods, manufacturing non-conformances

Repairs: Temporary repairs, permanent repairs, In-service repairs, Customizations and modifications

UNIT VIII INDUSTRY APPROVED AIRCRAFT DESIGN AND ANALYSIS REFERENCES 4

Industry approved references:

TOTAL : 45

REFERENCES

1. J.D. Anderson, "Fundamental of Aerodynamics", McGraw-Hill Book Co., New York, 1985.
2. E.L. Houghton and N.B. Carruthers, "Aerodynamics for Engineering Students", Edward Arnold Publishers Ltd., London (First Indian Edition), 1988.
3. G.C. Oates, "Aerothermodynamics of Aircraft Engine Components", AIAA Education Series, Published by AIAA, New York, 1985.
4. G.C. Oates, "Aircraft Propulsion system technology & design", AIAA Education Series, 1989.
5. E.F. Bruhn, "Analysis and Design of Flight Vehicle Structures", Tristate Offset Co., 1980.
7. Megson, T.M.G, "Aircraft Structures for Engineering Students", Edward Arnold, 1989.

PAT101 AIRLINES AND AIRPORT MANAGEMENT

L	T	P	C
3	0	0	3

GOAL

To provide the knowledge of airport planning, management and operations that is required to begin an airport management career

OBJECTIVES

The course should help the students to

1. Enable knowledge about introduction to management
2. Enrich idea about airport management
3. Provide the details about the airport services
4. Enrich idea about the institutional framework
5. Provide the details about controlling

OUTCOMES

The students should be able to

1. Understand about the aviation challenges and its environment
2. Understand about airport planning and organisational structure.
3. Understand about the trends and scenario in aviation
4. Understand about the economics in aviation
5. Understand about the airspace and security

UNIT I INTRODUCTION**9**

Evolution of Management - History of Aviation - Organization, Global, Social, and Ethical Environment - History of Indian Airline Industry - Major Players in Airline Industry - SWOT analysis in Airline Industry- Market potential on Indian Airline Industry- Current Challenges in Airline Industry- Completion in Airline Industry

UNIT II AIRPORT MANAGEMENT**8**

Airport Planning - Terminal Planning, design and operation - Airport Operations - Airport Functions - Organization Structure of Airline sectors - Airport Authorities - Global and Indian Scenario of Airport Management

UNIT III AIR TRANSPORT SERVICES**12**

International Trends - Emerging Indian Scenario - Private Participation : International Developments- Private Participation in Indian Airports - Environmental regulations - Regulatory Issues - Meteorological Services in Aviation - Airport fees, rates and charges

UNIT IV INSTITUTIONAL FRAMEWORK**8**

Safety Regulation - Economic Regulation - Management of Bilaterals - Aviation Security

UNIT V CONTROLLING**8**

Traffic Control - Airspace and Navigational aids - Controlling Process - Coordination - Response to emergencies and airport Securities - Case Studies in Airline Industry

TOTAL: 45**TEXT BOOKS**

1. Graham.A. "Managing Airports: An International Perspective" - Butterworth - Heinemann, Oxford 2001.
2. Wells.A. "Airport Planning and Management", 4th Edition McGraw- Hill, London 2000

REFERENCES

1. Doganis. R. "The Airport Business" Routledge, London 1992
2. Alexander T. Wells, Seth Young, "Principles of Airport Management", McGraw Hill 2003
3. P S Senguttavan "Fundamentals of Air Transport Management", Excel Books 2007
4. Richard de Neufille, "Airport Systems: Planning, Design and Management", McGraw-Hill London 2007.

PRACTICAL
PAM 111 AERO ENGINE REPAIR & MAINTENANCE LABORATORY

L T P C
0 0 2 1

GOAL

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

OBJECTIVES

The course should enable the students to

1. Understand the procedure for stripping of piston engines
2. Know the detailed procedure for cleaning, inspection & NDT checks on Piston engine components.
3. Understand the procedure & Precautions of Piston engine Re-assembly.
4. Know the detailed procedure for stripping of auxiliary power unit (APU)
5. Familiarise with various checks carried out on A/C Gas Turbine Engine components
6. Know the procedure and precautions to be followed for Re-assembly of an APU.
7. Study the Piston and Gas Turbine Engine starting procedure.
8. Study of different types of propellers and its pitch setting.

OUTCOMES

The students should be able to

1. Carry out stripping of aircraft piston engine as per standard procedure.
2. Carry out dimensional check and NDT checks on piston engine components
3. Carry out Piston engine Re-assembly as per standard procedure
4. Carryout stripping of APU with proper precautions
5. Carryout NDT checks and dimensional checks on A/C Gas Turbine Engine components
6. Carry out re-assembly of an APU as per standard procedures.
7. Understand the precautions of Aero engine with precautions.
8. Describe the types of propeller and it's pitch setting

LIST OF EXPERIMENTS

1. Stripping of a piston engine
2. Engine (Piston Engine) - cleaning, visual inspection, NDT checks.
3. Piston Engine Components - dimensional checks.
4. Piston - Engine reassembly.

5. Propeller Pitch Setting
6. Stripping of a jet engine
7. Jet Engine - identification of components & defects.
8. Jet Engine - NDT checks and dimensional checks
9. Jet Engine - reassembly.
10. Engine starting procedures.

LIST OF EQUIPMENTS
(for a batch of 30 students)

SI.No	Equipments	Qty	Experiments No.
1	Piston Engines	2	1,2,3,4
2	Jet Engines	2	6,7,8,9
3	Propeller pitch setting stand	1	5
4	Aircraft with serviceable stand	1	1 to 10
5	Precision instruments (Vernier Caliper, Micro meter, Cylinder bore gauge, depth gauge, Bevel Protector and DTI)	2 each	3,5,8
6	NDT Equipments (Defectoscope, Dyepenetrant method, Hot oil Chalk Method)	1 each	2,8

SEMESTER III

PAM 112 AIRCRAFT MAINTENANCE MANAGEMENT

L	T	P	C
3	0	0	3

GOAL

This course explores the students confronting the various supervisory levels of aviation maintenance and management

OBJECTIVES

The course should enable the student to :

1. Know about fundamentals of Air Transportation and Airline Economics
2. Understand the Aircraft Reliability
3. Understand the Principles of Airline Scheduling
4. Study the computers in aircraft maintenance
5. Sstudy the Technology in Aircraft Maintenance

OUTCOME

The student should be able to understand :

1. The developments and organization structure of an Airline
2. The Fleet planning, the aircraft selection process, operating cost , Valuation & Depreciation etc.,
3. The Flight operations, and crew scheduling and details about Flight planning.
4. The Maintenance schedule& controlling with the help of computers.
5. The vibration and monitoring of engine

UNIT I AIRLINE ECONOMICS AND MAINTENANCE COST 8

Airworthiness and its regulation, Airline economics and the aircraft - Principle of airlines economics- Cost of aircraft maintenance

UNIT II SCHEDULE AND CONSTRAINTS 8

Aircraft reliability - The maintenance schedules and its determinations -conditions monitored maintenance - Extended range operation (EROPS) - Ageing aircraft.

UNIT III MAINTENANCE PRODUCTION 12

Airline scheduling (with reference to engineering)-Product support and spares- maintenance sharing - Equipment and tools for aircraft maintenance - Aircraft weight control - Budgetary control.

UNIT IV COMPUTER IN AIRCRAFT MAINTENANCE 10

Computer in aircraft maintenance - Artificial intelligence - Aircraft maintenance softwares.

UNIT V TECHNOLOGY IN AIRCRAFT MAINTENANCE

7

On board maintenance system - engine monitoring - Turbine engine oil maintenance - Turbine engine vibration monitoring in aircraft - Life usage monitoring - current capabilities of NDT. Helicopter maintenance - Future of aircraft maintenance, Case studies in aircraft maintenance.

TOTAL: 45

TEXT BOOKS

1. C.H. Friend "Aircraft Maintenance Management", 2000
2. K.C. Batra "Production Management", 2000.
3. Richardson J.D. "Essential of Airlines Management", 1998.
4. Banfe Charles F. "Airline Management" Englewood Cliffs, N.J Prentice -Hall 1992.

REFERENCES

1. D. Philip Locklin, "Economics of Transportation", 1997.
2. Laneja Nawal K, "Airlines in Transition", Lexington Mass, D.C. Heath 1981.

PAM 113 CIVIL AVIATION REQUIREMENTS -II

L	T	P	C
3	0	1	4

GOAL

To teach a civil aviation rules and regulations which are being followed by directorate general of civil aviation

OBJECTIVE

The subject should enable the students to

1. Understand the aircraft fuelling procedure and its precaution while fuelling.
2. Know the storage, handling and quality control of aviation fuel.
3. Know the overall and periodical inspection various aircraft instruments and equipments.
4. Conceive the significance of carrying out mandatory modifications and inspections.
5. Know the operational requirement to be compiled by operators for various operations.
6. Know the installation and maintenance procedure of various communication and navigation equipment.
7. Know about the storage condition and storage service life of aircraft components containing rubber parts.
8. Understand the significance and the procedure of flight test.
9. Know the various log books, documents, used in aircrafts and its importance to ensure air worthiness.

OUTCOME

The students should be able to

1. Carrying out fuelling and de-fuelling of modern aircrafts
2. Understand the handling and quality control procedure of aviation fuel.
3. Describe the overhaul and inspection procedure of various instruments
4. Know the importance of carrying out modifications and its procedure in detail
5. Understand the minimum operational requirement for aircrafts and helicopters
6. Describe the installation and maintenance procedure of various communication, navigation and radar equipment.
7. Store the aircraft components containing rubber parts as per CAR
8. Describe the detail procedure of flight test
9. Understand the log book entry procedure and various documents to be on board during various phases of flight

UNIT I C.A.R. SERIES H - REQUIREMENTS OF AIRCRAFT FUEL, FUELLING OF AIRCRAFT AND CALIBRATION 8

Aircraft fuels: Unusable fuel supply - calibration of fuel quantity gauge of aircraft; aircraft fueling procedures; aviation fuel at airport - storage, handling & quality control.

UNIT II C.A.R. SERIES I - AIRCRAFT INSTRUMENTS, EQUIPMENT AND ACCESSORIES 11

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

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

UNIT III C.A.R. SERIES M - MANDATORY MODIFICATIONS AND INSPECTIONS 15

Mandatory modification / inspections.C.A.R. Series O - operational requirement for aircraft:

Minimum requirements to be complied by operators; operation of commercial air transport aero planes; operation of general aviation airplanes; operation of commercial air transport helicopters; operation of general aviation helicopters; registration airworthiness and operation of hand gliders and powered hand gliders ; exit row seating.

UNIT IV C.A.R. SERIES R - AIRBORNE COMMUNICATION, NAVIGATION & RADAR 11

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

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

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

UNIT V C.A.R. SERIES T - FLIGHT TESTING OF AIRCRAFT

15

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

C.A.R. SERIES X - MISCELLANEOUS REQUIREMENTS:

Weight and balance control of an aircraft; provision of first aid kits & physician's kit in an aircraft; use of furnishing materials in aircraft; concessions; aircraft log books; document to be carried on board on Indian registered aircraft; procedure of aircraft for issue of taxi permit; procedure for issue of type approval of aircraft components and equipment including instruments. Civil Aviation Requirement - 145

TOTAL: 60

TEXT BOOKS

1. Aircraft manual (India) volume - latest edition, the English book store, 17-I, Connaught circus, New Delhi.
2. Civil aviation requirements with latest amendment (section 2 airworthiness) Published by DGCA, the English book store, 17-I, Connaught circus, New Delhi.
3. Aeronautical information circulars (relating to airworthiness) from DGCA. Advisory circulars from DGCA. CAR 145.

**PRACTICAL
PAE113 AIRCRAFT SYSTEM LABORATORY**

L	T	P	C
0	0	3	1

GOAL

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

OBJECTIVE

The subject should enable the students to

1. Understand the aircraft jacking up procedure and its precaution.
2. Understand the various methods of aircraft levelling and its procedure.
3. Understand the various check to be carried out to ensure the alignment of control surfaces.
4. Know the procedure and precaution of aircraft symmetry check.
5. Understand the various test carried out on hydraulic system components to assess leakage and blockage.
6. Know the procedure for carrying out the landing gear retraction test.

- Understand the various common snags in aircraft hydraulic and fuel systems and its rectification procedure.

OUTCOME

The students should be able to

- Carry out aircraft jacking safely without any damage to men equipment.
- Carry out aircraft levelling as per procedure.
- Describe the various checks to be carry out to ensure the alignment of control surfaces.
- Carryout aircraft symmetry check, as per procedure.
- Carryout flow test, and pressure test on hydraulic system.
- Describe the procedure for landing gear retraction test and various precautions to be undertaken before carrying out the test.
- Carry out rectification of common snags in aircraft hydraulic system as per procedure.

LIST OF EXPERIMENTS

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

LIST OF EQUIPMENTS

(For a batch of 30 students)

S.No.	Items	Quantity	Experiment No.
1.	Serviceable aircraft with all above systems	1	1,2,3,4,5,6,7,8,9,10
2.	Hydraulic Jacks (Screw Jack)	5	1,2,4
3.	Trestle adjustable	5	1,2,4
4.	Spirit Level	2	1
5.	Levelling Boards	2	1
6.	Cable Tensiometer	1	1
7.	Adjustable Spirit Level	1	1
8.	Plumb Bob	1	1

PAM114 & PAM115 PROJECT WORK (PHASE I & II)

L	T	P	C
0	0	36	18

GOAL

To impart and improve the capability of the students by designing or analysing in the field of aircraft maintenance engineering.

OBJECTIVES

The objective of the project work is to enable the students on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. Full semester shall be allotted and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

OUTCOMES

The students should be able to

1. Understand various procedures in identifying the project and literature survey, reference of journals, experiments and theoretical work
2. The continuous assessment shall be made as prescribed by the regulation (Hindustan University Regulations 2008 for ME. programme)

Total Credits: 12

ELECTIVE COURSE SEMESTER - III

PAM 701 AIRLINE OPERATION AND SCHEDULING

L	T	P	C
3	1	0	4

GOAL

Explores a variety of model and optimization techniques for the solution of airline schedule planning and operation

OBJECTIVES

The course should enable the student to :

1. Know about optimizing flow of networks
2. Understand about the fleet assignment
3. Understand the about crew Scheduling
4. Study about the operations recovery
5. Study robust scheduling

OUTCOME

The student should be able to understand :

1. The airline scheduling and networks in operations.
2. The Fleet assignment modeling and solutions
3. The crew allotment, pairing etc.
4. The operations control and challenges in it.
5. The robust and Degradable Schedule

UNIT I OPTIMIZING FLOW OF NETWORKS 15

Airline Schedule Planning - links to Operations - Time space networks - Constrained Shortest Path - Multi Commodity Flow Models - Column and Row Generation Techniques - Branch and Bound - Branch and Price cut - Computational Exercises - Passenger Mix Model

UNIT II FLEET ASSIGNMENT PROBLEM 15

Basic Models and Solutions - Approaches - Shortcomings Itinerary based Fleet Assignment Model - Sub network based Fleet - Assignment Model and Solution Approach - Fleet Assignment Model Extensions

UNIT III CREW SCHEDULING 10

Crew pairing problem - Bidline Generation/ Rostering - Crew Pairing problem Models and solutions - Branch on Follow ons - Review of Results of Barnhart - Aircraft Routing Problem Models - Solutions - Approaches - Constrained Shortest Path - Branch and Price - Integrated Crew Paring - Aircraft routing

UNIT IV OPERATIONS RECOVERY 10

Overview of Operation Control Centre - Aircraft Passenger Delays - Flight Postponement and Cancellation Model-Airline Operation Recovery - Challenges- - Role of Simulation

UNIT V ROBUST SCHEDULING 10

Robust Crew Scheduling - Robust Aircraft Routing - Degradable Schedule Design,2000.

TOTAL : 60

TEXT BOOK

1. Barnhart, C., F. Lu, and R. Shenoi. "Integrated Airline Scheduling." In Operations Research in the Air Industry,1996..

REFERENCES

1. Barnhart, C., and K. Talluri. "Airline Operations Research.",1998.
2. Chebalov, S., and D. Klabjan. "Robust Airline Crew Scheduling: Move-up Crews.",1998.

PAM 702 DIAGNOSTIC TECHNIQUES

L	T	P	C
3	1	0	4

GOAL

To study the importance and the different approaches to achieve the diagnostic algorithm

OBJECTIVES

The course should enable the student to :

1. Know about the defects and failure analysis
2. Understand about the maintenance system
3. Understand about the systematic maintenance
4. Study about the computer management in maintenance
5. Study about the conditioning monitoring

OUTCOME

The student should be able to understand :

1. The defect generation, defect analysis, failure types and analysis.
2. The types of maintenance as per need.
3. How to work and document the maintenance operation
4. The operations control and challenges in it.
5. Condition monitoring techniques & operation

UNIT I DEFECTS AND FAILURE ANALYSIS 10

Defect generation-types of failures-Defects reporting and recording-Defect analysis-Failure analysis-Equipment down time analysis-Breakdown analysis-TA,FMEA,FMECA.

UNIT II MAINTENANCE SYSTEMS 10

Planned and unplanned maintenance-Breakdown maintenance-Corrective Maintenance-Opportunistic maintenance-Routine maintenance-Preventive maintenance, Predictive maintenance-Condition based maintenance system-Design out maintenance-selection of maintenance system.

UNIT III SYSTEMATIC MAINTENANCE 15

Codification and Cataloguing-Instruction manual and operating manual-Maintenance manual and Departmental manual-Maintenance time standard-Maintenance work order and work permit -job monitoring-Feedback and control-Maintenance records and documentation.

UNIT IV COMPUTER MANAGED MAINTENANCE SYSTEM 10

Selection and scope of computerization-Equipment classification-Codification of breakdown, material and facilities-Job sequencing-Material management module-Captive Engineering module

UNIT V CONDITION MONITORING

15

Condition monitoring techniques-Visual monitoring-Temperature monitoring-vibration monitoring-Lubricant monitoring-Cracks monitoring-Thickness monitoring-Noise and sound monitoring-condition monitoring of hydraulic system. Machine diagnostics-Objectives-Monitoring strategies-Examples of monitoring and Diagnosis - Control structures for machine diagnosis.

TOTAL : 60

TEXT BOOKS

1. SUSHIL KUMAR SRIVASTAVA - "Industrial Maintenance Management", S.Chand & company Ltd., NewDelhi-1998.
2. MANFRED WECK, H.BIBRING - "Hand Book of Machine Tools, Vol 3.", John Wiley & Sons.

REFERENCE

1. Garg H.P, "Industrial Maintenance", S.Chand & company Ltd., NewDelhi-2000.

PAT 102 AIRLINES MARKETING MANAGEMENT

L	T	P	C
3	0	0	3

GOAL

To enable students understand the principles of marketing and the ways in which these principles can be applied in today's airline industry, the air transport market and its environment

OBJECTIVES

The course should enable the student to :

1. Know about the airline marketing.
2. Understand about the marketing of air transport services.
3. Understand about the product analysis
4. Study about the market research
5. Study about the IT impact in decision making

OUTCOME

The student should be able to understand :

1. The marketing environment and principles.
2. The analysis and types of marketing related air transport services
3. Product life cycle in airline marketing in detail
4. The tools involved in the market research
5. How online and IT enabled marketing played role

UNIT I INTRODUCTION**5**

Marketing conceptual frame work - marketing environment - customer oriented organization - marketing interface with other functional areas marketing in a globalised environment Marketing Mix - Stages in the Application of Marketing Principles to Airline Management.

UNIT II MARKET OF AIR TRANSPORT SERVICES**10**

Customer - Definition - Apparent and True Needs - Industrial Buying Behaviour - Customer in the Business Air Travel Market - Customer in Leisure Air Travel Market - Customer in the Air Freight Market - Market Segmentation in Air Passenger & Air Freight Market - Marketing Environment - Theoretical Basis of PESTE Analysis - Building Customer Satisfaction

UNIT III PRODUCT ANALYSIS IN AIRLINE MARKETING**10**

Product - definition - Product Life Cycle - Product Life Cycles in Aviation Industry - Managing Product Portfolio - Balancing Risk and Opportunity - Fleet & Schedules related Product Features - Customer Service Related Product Features - Pricing Decisions - Building Blocks in the Airline Pricing Policy - Uniform and Differential Pricing - Distribution Channel Strategies - Travel Agency Distribution System - Global Distribution System - promotion methods. Advertisement and personal selling, public relations.

UNIT IV MARKETING RESEARCH**10**

Types, process - tools and techniques - application of marketing research - product launching, demand estimation, advertising, brand preferences, customer satisfaction, retail stores image, customer perception, distribution, customer relationship, competitor analysis and related aspects - preparation of marketing research report - sample case studies.

UNIT V INFORMATION TECHNOLOGY IMPACT ON MARKETING DECISIONS**10**

Online marketing - web based marketing programmes - emerging now trends and challenges to marketers.

TOTAL : 45**TEXT BOOK**

1. Stephen Shaw "Airline Marketing and Management " Ashgate Sixth Edition,2000.

REFERENCES

1. Philip Kotler: "Marketing management" (Millennium edition), Prentice Hall of India P (ltd), New Delhi 2001.
2. Micheal R.Czinkota & Masaaki Kotabe, "Marketing management", Vikas Thomson learning 2000.
3. Douglas, J.Darymple "Marketing management", John Wiley & Sons, 2000
4. NAG, "Marketing successfully A professional perceptive", Macmilan 2001.
5. Boyd Walker, "Marketing Management", McGraw Hill, 2002
6. Aakar Day, Kumar, "Essential of Marketing Research", Keith Flether, "Marketing Management and Information Technology", Prentice Hall, 1998.

PAM 703 HELICOPTER MAINTENANCE

L T P C
3 0 0 3

GOAL

To make the students understand the basic concepts of Helicopter maintenance and repair procedures followed for overhauling.

OBJECTIVE

The subject should enable the students to understand

1. Fundamentals of Helicopter and ground handling of bearings
2. Basic concepts of Head maintenance, vibration tracking of helicopter blades. Flight control systems and mast adjustment concepts
3. Concept of main rotor transmission, spray clutch with importance of torque meter maintenance
4. Importance of power plants and tail rotors servicing and system rigging is executed
5. Basic fuselage maintenance and special hardware requirements

OUTCOME

The students should be able to

1. Helicopter basics are clearly understood and various maintenance procedures are followed
2. Get a clear idea about Head maintenance with flight and mast control systems
3. Understand the transmission process in helicopter rotor and torque meter working
4. Power plant rotors and tail rotor working is studied. Concept of rigging is clearly understood
5. Get an idea about fuselage maintenance procedures with special hardware requirements.

UNIT I HELICOPTER FUNDAMENTALS 5

Basic directions - Ground handling, bearings - Gears.

UNIT II MAIN ROTOR SYSTEM 9

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

UNIT III MAIN ROTOR TRANSMISSIONS 12

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

UNIT IV POWER PLANTS & TAIL ROTORS **12**

Fixed wing power plant modifications - Installation - Different type of power plant maintenance. Tail rotor system - Servicing tail rotor track - System rigging.

UNIT V AIRFRAMES AND RELATED SYSTEMS **7**

Fuselage maintenance - Airframe Systems - Special purpose equipment.

TOTAL : 45

TEXT BOOK

1. JEPPESEN, "Helicopter Maintenance", Jeppesons and Sons Inc., 2000.

REFERENCES

1. "Civil Aircraft Inspection Procedures", Part I and II, CAA, English Book House, New Delhi - 16.
2. LARRY REITHMIER, "Aircraft Repair Manual", Palamar Books Marquette, 1992.

PAM 704 AIRCRAFT NAVIGATION SYSTEMS

L	T	P	C
3	1	0	4

GOAL

To study the different types and techniques of navigation systems

OBJECTIVES

The course should enable the student to :

1. Know about the radio navigation
2. Understand about the approach and landing aid
3. Understand about the inertial sensors
4. Study about the inertial navigation systems
5. Study about the satellite & hybrid navigation

OUTCOME

The student should be able to understand :

1. The types of radio navigation
2. The types of system in approach and landing
3. The gyros and accelerometers
4. The INS, gimbal and other related devices.
5. Advance GPS and INS systems

UNIT I RADIO NAVIGATION 12

Different types of radio navigation-ADF, VOR/DME- Doppler -LORAN and Omega

UNIT II APPROACH AND LANDING AID 12

ILS, MLS, GLS - Ground controlled approach system - surveillance systems-radio altimeter

UNIT III INERTIAL SENSORS 12

Gyroscopes-Mechanical-electromechanical-Ring Laser gyro- Fibre optic gyro, Accelerometers

UNIT IV INERTIAL NAVIGATION SYSTEMS 12

INS components: transfer function and errors-The earth in inertial space, the coriolis effect-Mechanisation. Platform and Strap down, INS system block diagram, Different co-ordinate systems, Schuler loop, compensation errors, Cross coupling, Gimbal lock, Alignment.

UNIT V SATELLITE NAVIGATION & HYBRID NAVIGATION 12

Introduction to GPS -system description -basic principles -position and velocity determination-signal structure-DGPS, Introduction to Kalman filtering-Estimation and mixed mode navigation-Integration of GPS and INS-utilization of navigation systems in aircraft

TOTAL: 60

TEXT BOOK

1. Nagaraja, N.S. "Elements of Electronic Navigation", Tata McGraw-Hill Pub. Co., New Delhi, 1975.
2. Slater, J.M. Donnel, C.F.O and others, "Inertial Navigation Analysis and Design", McGraw-Hill Book Company, New York, 1964.
3. Sen, A.K. & Bhattacharya, A.B. "Radar System and Radar Aids to Navigation", Khanna Publishers, 1988.

REFERENCES

1. Albert Helfrick, "Practical Aircraft Electronic Systems", Prentice Hall Education, Career & Technology, 1995
2. Albert D. Helfrick, "Modern Aviation Electronics", Second Edition, Prentice Hall Career & Technology, 1994
3. George M Siouris, "Aerospace Avionics System; A Modern Synthesis", Academic Press Inc., 1993
4. Myron Kyton, Walfred Fried, "Avionics Navigation Systems", John Wiley & Sons, 1997

PBA 302 ENTREPRENEURSHIP DEVELOPMENT

L	T	P	C
3	0	0	3

GOAL

To provide the theoretical foundation of entrepreneurship development

OBJECTIVES

The course should enable the student to :

1. Know about the entrepreneurial competence
2. Understand about the entrepreneurial environment
3. Understand about the business plan preparation
4. Study about the launching of small business
5. Study about the management of small business

OUTCOME

The student should be able to understand :

1. The concept, personality, knowledge, skills required
2. The role of family & society, rules and regulations of government
3. The sources, criteria, capital, budget, feasibility
4. The finance, human resource, growth strategy monitoring and evaluation of Business - rehabilitation of business units and effective management of small business

UNIT I ENTREPRENEURIAL COMPETENCE 6

Entrepreneurship concept - Entrepreneurship as a Career - Entrepreneur - Personality Characteristics of Successful. Entrepreneur - Knowledge and Skills Required for an Entrepreneur.

UNIT II ENTREPRENEURIAL ENVIRONMENT 12

Business Environment - Role of Family and Society - Entrepreneurship Development Training and Other Support Organisational Services - Central and State Government Industrial Policies and Regulations - International Business.

UNIT III BUSINESS PLAN PREPARATION 12

Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership - Capital - Budgeting Project Profile Preparation - Matching Entrepreneur with the Project - Feasibility Report Preparation and Evaluation Criteria.

UNIT IV LAUNCHING OF SMALL BUSINESS 10

Finance and Human Resource Mobilization Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching.

UNITV MANAGEMENT OF SMALL BUSINESS**5**

Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business Units.
Effective Management of small Business.

TOTAL: 45**TEXT BOOKS:**

1. Hisrich, "Entrepreneurship", Tata McGraw Hill, New Delhi, 2001.
2. P. Saravanavel, "Entrepreneurial Development", Ess Pee kay Publishing House, Chennai - 1997.
3. S.S.Khanka, "Entrepreneurial Development", S.Chand and Company Limited, New Delhi, 2001.

PAM 705 AVIATION SAFETY MANAGEMENT

L	T	P	C
3	0	0	3

GOAL

To teach the students about of flight safety and other key safety issues in the aviation industry

OBJECTIVES

The course should enable the student to :

1. Know about the Aviation safety
2. Understand about the human factors in aviation safety
3. Understand about aviation safety program elements
4. Study about the aircraft maintenance safety
5. Study about the airports and heliports

OUTCOME

The student should be able to understand :

1. The concept of safety ,accident causes, prevention methodology and risk management
2. The risk theory, Human difficulties, training, performance and ist factors
3. Internal Reporting Systems, Aviation Safety Committees, Inspection Programs and Evaluation, Flight Operation Safety Inspection and Format - Aviation Safety Education and Training and Safety Awards Programs
4. Aircraft Discrepancies, Configuration Control, Maintenance Engine Runs and Taxiing, Maintenance Test Flights , maintenance Analysis, Tool Control. Hazardous Waste Disposal - Bogus parts
5. Airport Certification Manual, Emergency Plan, Airports/Heliports criteria , Foreign Object Control and maintenance of airports

UNIT I INTRODUCTION

12

Aviation safety - Meaning - Need - Economic of Aviation Safety - Safety Vs Mission - Randomness of Damage and Injury - Zero Accident Rate - Accident causes - Multiple Vs Single Cause - Aircraft Accident - Aircraft Mishap - Aircraft Incident - Building Aviation Safety Program - Prevention Methodology - Risk Management

UNIT II HUMAN FACTORS IN AVIATION SAFETY

8

Theory of Risk - Changing the Behaviour of the risk takers - Attitudes - Discipline - Punishment - Protection of Safety - Motivating Safe Behaviour - Human factors difficulties - Training involving human factors - Human Performance Concerns - Human Performance Factors

UNIT III AVIATION SAFETY PROGRAM ELEMENTS

10

Internal Reporting Systems - Information Distribution systems - Aviation Safety Committees - Aviation Safety Inspection Programs - Aviation safety program Evaluation - Flight Operation Safety Inspection - Safety Inspection report Format - Aviation Safety Education and Training - Aviation Safety Awards Programs - Accident Preparation and Investigation

UNIT IV AIRCRAFT MAINTENANCE SAFETY

8

Aircraft Discrepancies - Delayed and Deferred Discrepancies - Training - Configuration Control - Maintenance Engine Runs and Taxiing - Maintenance Test Flights - maintenance Analysis - Tool Control - Hazardous Waste Disposal - Bogus parts - Technical Data - maintenance Inspections - Flight Line Practices - Maintenance Safety Programs - Maintenance Safety Inspections

UNIT V AIRPORTS AND HELIPORTS

7

Airport Certification Manual - Airport Emergency Plan - Airports/Heliports criteria - Airfield Criteria - Airspace Criteria - Foreign Object Control - Bird Hazards - Snow and Ice Removal - Fuel Handling - Vehicle Control - Airport and Heliport Safety Inspections

TOTAL: 45

TEXT BOOK

1. "Aviation Safety Programs - A Management Handbook" - Richard H. Wood.

PAM 706 SYSTEM SIMULATION AND MODELLING

L	T	P	C
3	1	0	4

GOAL

To introduce the concepts of systems simulation design and modeling techniques

OBJECTIVES

The course should enable the student to :

1. Know about the fundamentals of simulation
2. Understand about the random numbers
3. Understand about the design of simulation experiments
4. Study about the simulation languages
5. Practice case studies and carry out mini projects

OUTCOME

The student should be able to understand :

1. The simulation concept, modeling, various types, usage as a tool
2. The pseudo random numbers and its generation and testing of random numbers
3. The formulation, data collection experimental considerations, flow chart, output and results interpretation
4. The study of GPS and its applications
5. Application of simulation language studied and doing a project involving systems like, queuing, production, inventory, maintenance and replacement systems

UNIT I INTRODUCTION 12

Systems, modeling, general systems theory, concept of simulation, simulation as a decision making tool, types of simulation.

UNIT II RANDOM NUMBERS 12

Pseudo random numbers, methods of generating random varieties, discrete and continuous distributions, testing of random numbers.

UNIT III DESIGN OF SIMULATION EXPERIMENTS 12

Problem formulation, data collection and reduction, time flow mechanism, key variables, logic flow chart, starting condition, run size, experimental design consideration, output analysis and interpretation validation.

UNIT IV SIMULATION LANGUAGES 12

Simulation languages - study of GPSS and Applications.

UNIT V CASE STUDIES/MINI PROJECT

12

Development of simulation models using the simulation language studied for systems like, queuing systems, production systems, inventory systems, maintenance and replacement systems, investment analysis and network in aviation industry.

TOTAL: 60

TEXT BOOKS

1. Jerry Banks and John S. Carson, Barry L Nelson, David M. Nicol, "Discrete event system simulation", Prentice Hall, India, 2002.
2. Shannon, R.E. "Systems simulation, The art and Science", Prentice Hall, 1975.
3. Thomas J. Schriber, "Simulation using GPSS", John Wiley, 1991

REFERENCES

1. Narsingh Deo, "System Simulation with Digital Computer", PHI, 1979.
2. Subramanian KRV and Sundaresan R Kadayam, "System Simulation - An Introduction to GPSS", CBS Publishers, New Delhi, 1993.
3. Zaven A. Karian and Edward J. Dudewicz, "Modern Statistical, Systems, and GPSS Simulation", CRC Press, Washington D C, 1999.

PAM 707 ADVANCED OPTIMIZATION TECHNIQUES

L	T	P	C
3	1	0	4

GOAL

To teach the various aspects of optimization problems and its application

OBJECTIVES

The course should enable the student to :

1. Know about the fundamentals of optimization
2. Understand about different methods of optimization

OUTCOME

The student should be able to understand :

1. The classification and application of optimization
2. Karmakars method, Quadratic programming, non-linear programming, unconstrained optimization techniques, basics of constrained optimization
3. Integer and non linear programming methods and application and basics of geometric programming
4. Multi-objective optimization methods and application, separable programming and stochastic programming

UNIT I INTRODUCTION	12
Classification of optimization problems, Applications of optimization, concepts of design vector, Design constraints, constraints surface, objective function surfaces and multi-level optimization.	
UNIT II OPTIMIZATION - I	12
Karmakars method of solving L.P.problem, Quadratic programming, non-linear programming - unconstrained optimization techniques, Basics of constrained optimization.	
UNIT III OPTIMIZATION - II	12
Integer linear programming methods and application, Introduction to integer non-linear programming, Basics of geometric programming.	
UNIT IV OPTIMIZATION - III	12
Multi-objective optimization methods and application, Formulation of problems - Separable programming and stochastic programming.	
UNIT V OPTIMIZATION - IV	12
Introduction to Genetic algorithms, Simulated Annealing, neural network based optimization and optimization of fuzzy systems.	

TOTAL: 60

TEXT BOOK

1. Fredrick S.Hillier and G.J.Liberman, "Introduction to Operations Research", McGraw Hill Inc. 1995.

REFERENCES

1. Singiresu S.Rao, "Engineering optimization - Theory and practices", John Wiley and Sons, 1996.
2. Ravindran - Phillips -Solberg, "Operations Research - Principles and Practice", John Wiley and Sons, 1987.

PAM 708 LOGISTICS AND SUPPLY CHAIN MANAGEMENT

L	T	P	C
3	1	0	3

GOAL

To teach the importance and the role of logistical management in the aviation industry

OBJECTIVES

The course should enable the student to :

1. Know about the overview of supply chain management
2. Understand about co-ordination and management of transportation
3. Understand about the interfaces with other area
4. Understand about international logistics
5. Study about the management of small business
6. Understand decision models

OUTCOME

The student should be able to understand :

1. The role and scope of supply chain management. customer driver, logistics and competitive strategy
2. The inventory, order processing, purchasing, ware housing, Materials handling packaging and customer service management
3. The marketing. finance and supply chain interface. distribution planning and warehouse location, distribution policies and plans The finance, human resource, growth strategy
4. Ocean Carrier Management, Import-Export Logistic Management- case study in the airline industry
5. Decision support models, Transportation Systems, Warehouse Design, Distribution Inventory Policies, Transshipment and information Systems

UNIT I OVERVIEW OF SUPPLY CHAIN MANAGEMENT 7

Role of Supply Chain Management: Scope and Importance, Customer Driver Strategies, Logistics and Competitive Strategy: Systems view.

UNIT II CO-ORDINATION AND MANAGEMENT OF TRANSPORTATION 8

Inventory, Order Processing, Purchasing, Warehousing, Materials Handling, Packaging, Customer Service Management.

UNIT III INTERFACES WITH OTHER AREA 10

Marketing and Supply Chain Interface, Finance and Supply Chain Interface. Distribution Network Planning and Warehouse Location, Integrated Supply, Production, distribution Policies and Plans.

UNIT IV INTERNATIONAL LOGISTICS**10**

Ocean Carrier Management, Import-Export Logistic Management- case study in the airline industry

UNIT V DECISION MODELS**10**

Decision support models of supply chain management: Transportation Systems, Warehouse Design, Distribution Inventory Policies, Transshipment, etc. Information Systems.

TOTAL: 45**TEXT BOOKS**

1. Donald J. Bowersox & David J. Closs, "Logistical Management", Tata McGraw-Hill Editions, New Delhi, 2000.
2. Jeremy F. Shapiro, "Modelling and Supply Chain", Thomson Learning, 2001.
3. Martin Christopher, "Logistics and supply chain management", financial times management, 2000.

REFERENCES

1. David Taylor and David Brunt, "Manufacturing Operations and Supply Chain Management", Vikas Thomson Learning, 2001.
2. Philippe - Pierre Dornier, "Global operations & logistics", John Wiley & sons Inc, New York, 2002.
3. Monczka / Trend / Handfiled, "Purchasing and Supply chain management", Thomson southwestern college publishing, 2000.
4. B.S. Sahay, "Supply chain management for global competitiveness", Macmillan India Ltd, Delhi, 2000.
5. David Hutchins, "Just in Time", Jaico Publishing House, Mumbai, 2001
6. David Simchi - Levi & Philip Kaminsk, "Designing and managing the supply chain", McGraw-Hill Companies Inc., 2000.

