

AIRCRAFT MATERIALS AND PROCESSES

	L	T	P
Hrs./Week	4	-	2

RATIONALE

The high strength over weight ratio of materials required in Aeronautical Engineering, calls for study of such materials by students at this state. The need for surface treatment against corrosion and for improved strength is essential. In this regard, various processes of manufacturing are studied in this subject by the students.

DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Introduction Importance of strength/weight ratio in aircraft Manufacturing. The factor of Temperature variations. Choice of materials for different parts of airplane.	4	Demonstration of this aspects by showing actual aircraft parts.	4
2.	Aluminum alloys. Specification of Aluminum alloys for Different parts of wing and fuselage. Skin heat treatment corrosion resistance alloys.	6	Demonstration of different Parts of aluminum alloys	6
3.	Aircraft steel Classification of alloys steels, Effect of alloying elements, Carbon steel vs alloy steel, heat Treatment, typical alloy steels for different Aircraft parts.		Demonstration of various parts of steel on aircrafts.	6
4.	High strength and heat resistant alloy	6		
4.1	Classification of heat resistant alloys			
4.2	Iron, nickel and cobalt base alloys			
4.3	Refractory materials; ceramics			
4.4	Titanium and its alloys			
4.5	Properties of inconel, monel and K-monel. Nimonic and super alloys			
4.6	Application to Engine parts			
5.	Aircraft woods:	5		
5.1	Use of seasoning of woods:			
5.2	Fabric and dope			

5.3	Plastics, Rubber and other Synthetic materials.			
6.	Composite materials:			
6.1	Classification of composite materials Their characteristics.			
6.2	Theory of fibre strengthening			
6.3	Composites for normal and High temperatures.			
7.	Machine tools			
	Standard machine tools and Their applications in Aeronautical engineering field	2	Practical study of machine tools and their identification	1
8.	Casting and forming			
8.1	Pattern design: Casting methods Precision casting	5	Visual Examination of castings	2
8.2	Casting defects, Casting practice as applied To light alloys and alloy steel			
8.3	Sheet metal forming Hydraulic presses Types of presses and their selection		use of hydraulic press	1
8.4	Forgings			
8.4.1	Forgings operations forge plant equipment			
8.4.2	Drop forging: Practice as applied to light alloys			
9.	Metal joining Processes weld ability, MIG,TIG welding, arc Welding resistance Welding. Welding of light alloys, riveting	5	Riveting practice identification of special rivets and their uses in aircraft	2
10.	Heat treatment Practical methods of treatment Equipment surface hardening Processes and equipment	5	Use of heat treatment equipment	2
11.	Jigs and fixtures: General design, Methods of locating Cylindrical and flat surface design Principles of jigs for wing and uselage.	6	Set up of jigs for smaller exercise	
12.	Special processes	5		
12.1	Profiling, Hydro forming		Practical demonstration	2

	Man forming integral machining, Contour etching, high energy rate forming.		
12.2	Method of manufacturing honey comb structures.		
12.3	Particular methods of Fabricating aircraft and engine parts		
13.	Manufacture of plastic and Composite materials.	4	Casting of composite materials 3
13.1	Materials and process section		
13.2	Moulding, casting matching and Joining of plastics		
13.3	Filament winding		

AIRICRAFT INSTRUMENT-I

	L	t	p
Hrs./Week	2	-	3

RATIONALE

Instruments form eyes and ears and are required for monitoring the performance of various systems and the aircraft as a whole.

Students should have adequate knowledge of the working principle and basic construction of all instruments on board an aircraft. They should be able to remove and fit instruments with ease.

Simultaneously the students should be able to identify, fit, remove and be familiar with working of CVR (Cockpit voice recorder) CDR (Crash Data Recorder), and FDR (Flight Data Recorder)

The knowledge gained should be sufficient to understand interdependence of instruments and identify fault level. The students should also be able to carry out. Independently, compass swing on the aircraft.

Teachers have to be carefull in limiting instructions only to fitment/removal and system fault diagnosis.

DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	General aircraft instruments	2	identification of aircraft Instrument and note position Of instruments	2
2.	Measurement system transducers, Recorders display measure		Damnifying various components4 of measure and location of components	
3.	PITOT STATIC SYSTEM	12		
3.1	Principle		identifying the components, leak Test carry out calibration.	
3.2	System			
3.3	Altimeter		Removal and fitment	
3.4	Rate of climb indicator (ROCI)		Fault finding and leak check	6
3.5	Air speed indicator (ASI) And mechmeter.		Check and calibrate	4
4.	Position indicators Principle	6	Locate and calibrate various components In cockpit	4
5.	Control position, door/ramp, machine, light Engine instruments Navigation instruments Electrical instruments.	6	Removal and fitment	10

AIRCRAFT STRUCTURE

	L	T	P
Hrs./Week4	-	2	

RATIONALE

The Diploma holder in Aircraft Maintenance must have knowledge of various aircraft parts, aircraft hardware, aircraft fabric cables. This knowledge will be useful to him later when he will undertake repair and maintenance of aircrafts. Hence this subject.

DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Classification of Aircraft primary and secondary	1	Demonstration of fuselage, main plane and empennage of aircraft	3
2.	Major parts of an aircraft	12		
2.1	Fuselage			
2.2	Main plane			
2.3	Empennage			
2.4	Primary control surfaces		Demonstration of operation On aircraft primary and secondary Control surfaces	
2.5	Secondary control surfaces			
3.	Aircraft Hardware	25	Identification of aircraft hardware and aircraft joints	3
3.1	Bolts and Nuts			
3.2	Screws			
3.3	Locking devices			
3.4	Rivets			
4.	Aircraft joints	3		
4.1	Permanent joints			
4.2	Temporary Joints			
4.3	Semi permanent joints			
5.	Location numbering System of aircraft	3	Demonstration aircraft numbering system	5
5.1	Fuselage stations			
5.2	Wing stations			
5.3	Butt line stations			
5.4	Aircraft zoning			

6.	Aircraft fabric, Cloth and wood	15	Demonstration of aircraft fabric, and wooden parts	8
6.1	Aircraft fabric			
6.2	Aircraft clothes			
6.3	Aircraft covering practice			
6.4	Aircraft wood & wood working tools			
6.5	Wood joints including glue and joints			
7.	Aircraft control cables Pulleys and turn buckets	5	Layout and demonstration of aircraft cables. Pulleys and turnbuckles	5
7.1	Control cables			
7.2	Pulleys and turnbuckles			

POWER PLANT SYSTEM – PISTON ENGINES

Hrs./Week	L	T	P
	4	-	2

DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Exhaust system of various Types of piston engines. Piston engines.	5	Dismantling of exhaust collector ring and open stroke, Removing and installing	6
2.	Induction system including the carburetors Direct fuel injections, their constructions, Operations and functions of parts.	15	Dismantling different types of Carburetors	7
3.	Oil systems, its components and operation Requirement and purpose of oil, factors affecting The oil consumption.	15	Removing and installing	6
4.	Fuel system and its various components, their Construction and operation	14	Removing and installing the system components	7
5.	Ignition and starting system including Magneto, auxiliary starting devices and Starters.	-	carrying out magneto timing, checking adjustment, gap setting spark plug cleaning servicing, gap setting	7
5.1	Spark plugs, construction, inspection And serving procedure.	-	and installing	

AIRCRAFT SYSTEMS-I

	L	T	P
Hrs. /Week	3	-	1

RATIONALE

Diploma holders in Aeronautical Engineering and Aircraft Maintenance must have a sound knowledge of various mechanical and electrical systems which go in the airframe. This subject is designed to give them an insight into typical systems so that they understand their principles of working. This would also help them in acquiring skills in maintenance of these systems.

The course will provide basic knowledge of how the systems operate, what are the services operated in these systems, their salient features etc. further specialization will be necessary if they have to work on any one of these systems when students are inducted in service. The students should be physically shown typical systems on the aircraft and be asked to trace various components so that they get familiarized with these systems as they are installed in the aircraft.

DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Hydraulic system	30		
1.1	Introduction to Hydraulic systems.			
1.2	Need of hydraulics. Properties of hydraulic fluids			
1.3	Study of schematic diagram of typical Hydraulic system.			
1.4	Services catered by Hydraulic system of a Typical aircraft		Demonstration of the system in the aircraft and trace out various items with Associated piping and see the operation of The system on ground.	8
1.5	Basic Elements Hydraulic system			
	- Hydraulic pump			
	- Hydraulic pump			
	- Accumulator			
	- Reservoir			
	- selector			
	- Selector valves			
	- Relief Valves			
	- Jacks			
	- indicating devices			
	- actuating units.			

1.6	Introduction to landing Gear system-		
	- fixed		
	- Retractable		
	- Warning /indication devices		
2.	Wheel and brakes system	14	
2.1	Basic concepts of wheel and brake System.		
2.2	Types		To study the system in
	-Mechanical		The aircraft and trace out various
	-Pneumatic		items with associated piping and
			Trouble shooting
2.3	Study of schematic diagram of Typical wheel and brakes systems.		6
2.4	Basic elements of wheels and brakes systems		
2.5	concept of Anti-skid Systems.		
2.6	Dampers		
3.	Introducing to Pneumatic systems.		
3.1	Anti-icing		
3.2	Valves, regulators Indicators.		

CHAPTER-IV
MAINTENANCE CONCEPT AND PRACTICES-I

L T P
Hrs./Week 3 - 2

RATIONALE

The subject with the maintenance concepts and practices in the general and as applicable to aeronautical field. The students will acquire knowledge and skill in the maintenance of aircraft and its system, organization required, controls and economics of maintenance. The teaching is to be practice-oriented.

DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Maintenance definition and scope	3	An exercise in under standing in and actual situation.	4
1.1	Definition			
1.2	Break down maintenance			
1.3	Preventive maintenance			
1.4	On-time and off-time maintenance			
2.	Organization			
2.1	The maintenance manger	7		
2.2	Organization under maintenance Manager (Responsibility)			
3.	Economics of maintenance	10	Estimating the maintenance cost	6
3.1	Maintenance costs and budgets			
3.2	Cost control for effective operation			
4.	Controls of maintenance	10		
4.1	work authorization and control			
4.2	work scheduling			
4.3	Documentation Related to maintenance		Various documents identification and use	6
5.	Corrosion control	10		
5.1	Corrosion			
5.2	Corrosion preventing		practical work in painting, Plating shops etc.	10
6.	Chemical and abrasive Cleaning	4		
7.	Preservation, packing and storage	4		

MINOR PROJECT WORK

	L	T	P
Hrs./Week	-	-	4

Minor project work aims at exposing the students to industrial practices, types of repair and maintenance operation being performed and work culture in the aircraft industries. For the purpose, students during middle of course are required to be sent for a period of 4 weeks to different aircraft industries.

- i) Study various machining operation.
- ii) Study various repair and maintenance procedures being adopted in industries.
- iii) Learn about various methods of testing carried out on aircrafts.
- iv) Know about various methods of testing carried out on aircrafts.
- v) Know about cutting parameters being used while machining different materials.
- vi) Study the assembly and disassembly of various aircrafts.
- vii) Know about various quality control techniques.

As a minor project activity, each student is supposed to study the different operation and prepare detailed project report of the processes/operation seen by him/her. These students should be guided by respective subject teachers. Each teacher may guide a group of 4-5 students.

The teacher alongwith person from the industries will conduct performance assessment of students. The criteria for assessment will be as follows:

	<u>Criteria</u>	<u>Weight age</u>
a)	Attendance and punctuality	25%
b)	Initiative in performing tasks/	25%
c)	Relation with people	25%
d)	Report writing	25%
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