

## ENGINEERING DRAWING-II

	<b>L</b>	<b>T</b>	<b>P</b>
Hrs./Week	-	-	

### DETAILED CONTENTS

1. Detail and Assembly Drawing
  - a) Principle of detail and assembly drawings.
  - b) Practical exercise on drawing from detail to assembly or vice versa using wooden joints as example.
2. Fasteners I
  - a) Conventional symbols for internal and external threads.
  - b) Nuts, bolts, studs, screws and their application
  - c) Practical Application
3. Fasteners II (welded joint)
  - a) Various conventions and symbols of welded joint.
  - b) Practical application of welded joints say steel frames, windows, doors and furniture.
4. Rivets and Riveted joints
  - a) Types of rivet heads
  - b) Types of riveted joints
5. Keys and cotters
  - a) Various types of keys and cotters and their practical application.
6. Joints for Rods
  - a) Gib and cotter joint
  - b) Spigot and socket joint
7. Couplings
  - a) Flange coupling
  - b) Flexible coupling
8. Symbols and convention in aeronautical industry.
9. Limits, fits and tolerances;
  - a) Interchangeability
  - b) Tolerance of parts, tolerance zone, grades of tolerances.
  - c) Fits, types of fits-clearance, interference and transition.
  - d) Go, No, Go Limits
10. Surface finish and symbols.

## AIRCRAFT ELEMENTS

	<b>L</b>	<b>T</b>	<b>P</b>
Hrs. /Week	3	1	2

### RATIONALE

This course forms the first exposure to the discipline of Aeronautical Engineering. It starts with familiarization of airplanes and helicopters. The subject is built up slowly and steadily by introducing the terminology and basis of flight mechanics, airplane structures, power plant, systems etc. at the end of the subject, the student will be fully acquainted with the basics of Aeronautical Engineering.

### DETAILED CONTENTS

Sr. No.	THEORY	TIME (Hrs.)	PRACTICAL	TIME (Hrs.)
1.	Introduction			
1.1	Flying Machines: History of Aviation Different types with Examples	6	visual study of fixed wing aircraft and rotary wing craft	4
1.2	Lighter than air type. Balloons and Airships. Heavier than air type, kite Gliders, aircraft, modes of take off And landing			
1.3	Means of generating lift, flight of Birds And insects, leading to the flight of airplanes And helicopters and hovercraft			
1.4	Classification of airplanes based on distinguishable feature and usage along with examples			
1.5	Modern developments			
2.	Principles of flight	9	Exposure of features of different types of airplanes/ Observation of take off and landing of aircraft	6
	Mechanic concept of generation of Lift force: concept of angle of attack Drag and pitching moments on and airfoil			
2.1	Different airfoil shapes, derivation of Formulas $L=1/2 \quad V^2sC$ $D=1/2 \quad V^2sC$			
2.2	Flow over a wing and difference from that over an Airfoil section			
2.3	wing plan form shapes straight wing,			

	tapered wing, swept and their applications			
2.4	Control surfaces elevators, ailerons Flaps, rudders and their functions. Fly by wire			
2.5	Airplane stability and control			
3.	Introduction of Aircraft Power plants	9	Study of hardware and exposure To static testing of aero engines	6
3.1	Classification of propulsive units and Their design feature			
3.2	Propellers: fixed pitch and variable Pitch			
3.3	Piston-prop engine : Classification, different Types and arrangement for multi-cylinder engines			
3.4	Jet Engines: Classification, turbo-jet, Turbo-prop, Turbo-fan, Fan-jet.			
3.5	Rocket Engines: Solid and Liquid Rocket motors.			
3.6	Structural features and selection of Materials for power plants.			
4.	Aircraft Structures	9		
4.1	Concept of strength to weight ratio in Aeronautical Engineering		Exposure of disassembled parts of aircraft	6
4.2	Introduction of loads of different Parts of airplane			
4.3	Detailed description of wings, fuselage Tail surface			
4.4	Wing fuselage attachment-various Joining methods			
4.5	Under carriages: types and Description			
5.	Passenger comfort system:  Need for pressurization; oxygen requirements. Air conditioning systems	5	Demonstration of Passenger comfort system	2
6.	Navigation and communication system  Introduction to different navigation Methods, ILS HF and VHF systems	5	Demonstration of various Navigation methods	4
7.	Power Actuated systems: Introduction to basic Hydraulic system, pneumatic system, Auto Pilot system.	5	Exposure to power	

## GENERAL ENGINEERING

### RATIONALE

	L	T	P
Hrs./Week	1	-	3

The students are required to understand all the mechanical aspects of the aircraft in terms of thermodynamics and its application. Knowledge of relationships between pressure, volume and temperature under various operating conditions become necessary to understand the functioning of aircraft engines and other power systems.

Similarly the students are required to have basic knowledge of electrical engineering. Electrical engineering is required in the systems.

- Aircraft engine starting
- To provide power supply for communication and radio system for pilot /engineer
- Operation of machine
- General lighting galley etc.

The individual must be able to operate external power trolleys, APU's and internal batteries, monitor their performance and take remedial actions in case of abnormalities.

The instructor must be able to drive the basic knowledge of electrical terminologies, basic, block building components like batteries, diodes, transistors, chips micro processors, logic gates, computer etc.

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
<b>Part (A): Mechanical Engineering</b>				
1.	Introduction to	10		
	1.1 Concept to property, state, process, Systems cycle, thermo-dynamic pressure, Temperature and volume; Zeroth law Of thermodynamics			
	1.2 Energy concepts: Potential, kinetic internal, heat, flow work, work done		Study of pressure measurement devices	4
	1.3 Perfect gas: basic laws, equation of state, gas Constant, real gases and deviations in law Thermodynamic laws related to internal Combustion and gas turbine engines:	25		
2.	Basic thermodynamics process and work done And heat transfer during these process			
	- Constant volume and constant pressure		Study of Otto cycle With the help of a model	4
	- Isothermal, adiabatic, and polytropic			
	- Free expansion and throttling		Study of diesel cycle with	

2.2	Second law of thermo-dynamics Reversible and irreversible Process, concepts of internal energy Enthalpy and entropy		The help of a model Study of petrol engines and perform experiment for its performance	6
2.3	Change of entropy during a process and Gas processes on TS diagram			
3.	Heat Engines and Efficiencies			
3.1	Internal combustion engines: Otto, diesel and dual cycles Two and four strokes cycles		Study of Diesel engine and performance experiment for its performance	6
3.2	Gas turbine engines: Brayton cycle		Study of gas turbine Cycle on a model	4
<b>Part( B): Electrical Engineering</b>				
4.	Knowledge of electrical terminology like Voltage, amperes watts, VA, Ohms MHOS KWH Components and use of	12	Basic circuits using various  Ohm's law and Kirchhoff's law	4
4.1	components like resistor, capacitors, Inductors			
4.2	Average, RMS and peak value in AC Supply			
5.	Ohm's law and kirchoff's ;law	6		
6.	Electromagnetic induction: its Application in motor, relays, Actuators and micro switches	6		
7.	DC and AC generation, Constant and variable speed, Voltage regulator and its importance	4		
8.	Aircraft batteries: its electrolytes, Effect of temperature, charging procedure	8	Familiarization with batteries in lab and aircraft. Their charging Temperature, precaution thereof	4
8.1	Nickel cadmium battery			
8.2	Lead acid battery			
8.3	Dry cells			
9.	AC and DC power supplies used in aircraft	8	Familiarization of inverters and Generators in aircraft	4
10.	Aircraft lighting	4		
10.1	Internal (Normal and emergency) Cockpit, cabin, toilet			
10.2	External landing/taxi lights anti collision Navigation light/flashers			

11.	Ignition; magnetos	4
12.	Emergency labels fasten seat belts/ Go to seat/No smoking Exit and path signs	2
13.	Protection devices fuses, CB's, Current limiters	1
14.	Static Dischargers	1

## GENERAL WORKSHOP PRACTICE-II

	<b>L</b>	<b>T</b>	<b>P</b>
Hrs./Week	-	-	8

### ELECTRIC SHOP

1. Study of electrical safety measures and productive devices (2 Hrs.)
2. Practice of electrical connections by using switch and plug points ( 6 Hrs.)
3. Study and testing of common electrical appliances (6 Hrs.)
4. Charging a battery connections in series and parallel (4 Hrs.)
5. study of battery connection in series and parallel ( 6 Hrs.)
6. Laying out three phase wiring of an electrical motor ( 6 Hrs.)
7. Dismantling ; servicing and reassembling a table fan, ceiling fan and air cooler ( 10 Hrs.)

### SHEET METAL SHOP

1. Single row riveting exercise ( 4 Hrs.)
2. Double row riveting practice ( 6 Hrs.)
3. Riveting repair by patch ( 8 Hrs.)
4. Riveting repair by insertion ( 10 Hrs.)
5. Cutting and bending exercise on Aluminum sheets ( 8 Hrs.)
6. Pneumatic Riveting Exercise ( 5 Hrs.)

### MACHINE SHOP

1. Turning exercise on lathe ( 8 Hrs.)
2. Step turning and taper turning exercises ( 6 Hrs.)
3. Facing and knurling exercises ( 9 Hrs.)
4. Threading exercises-fine and course threading ( 10 Hrs.)
5. Drilling exercise ( 6 Hrs.)
6. Reaming exercises ( 6 Hrs.)
7. Exercises on power hacksaw ( 3 hrs.)

## AIRCRAFT RULES AND REGULATIONS-I

- (i) ABCDFHLX
- (ii) I.A.R.
- (iii) Advisory circular & A.M.E. Notices

	L	T	P
Hrs. /Week	3	-	1

### RATIONALE

Diploma holders in Aeronautical Engineering and Aircraft Maintenance are required to have a comprehensive knowledge of aircraft rules and regulations applicable to civil aircraft as laid down by the civil Aviation Authority of the country with particular reference to airworthiness and flight safety. Hence this subject, is essential that students should be shown the details of manuals. CARs, flight release books, AMMs, C of A and C of R.

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Knowledge of aircraft rules as I.A.R. F.A.R. as they relate to airworthiness And safety of aircraft	4		
2.	Knowledge of privileges and Responsibilities Of the various categories of AME licence And approved persons.	6		
3.	Knowledge of "Civil Airworthiness Requirements" Aeronautical information Circular (Relating to airworthiness)" "Advisory Circular "and AME Notices" issued By DGCA.	10		
4.	Knowledge of various mandatory documents like Certificates of registration, certificate of Airworthiness, flight manual, Export Certificate Of airworthiness.	5		
5.	Method of identifying approved material on aircraft	4		
6.	Knowledge of various documents/certificates Issued to establish airworthiness of aircraft Parts.	4		
7.	Various logbooks required to be Maintained for aircraft. Method of Maintaining the logbooks. Procedure For making entries in logbooks, journey Logbook, technical logbook etc.	10	Exercise to make logbook entire's	8
8.	Use of schedules its certification & Preservation	5	Exercise to use schedules on the aircraft.	