

# **Curriculum for Diploma Course**

**In**

**AERONAUTICAL ENGINEERING**

**&**

**AIRCRAFT MAINTENANCE**

**AND**

**A.M.E. (License) Course**

**Prepared by:**

**Curriculum Development Centre**

**Technical Teacher's Training Institute**

# STUDY AND EVALUATION SCHEME

## SEMESTER-I

SUBJECT	STUDY SCHEME			EVALUATION SCHEME				TOTAL MARKS
	HRS/WEEK			INTERNAL ASSESMENT		EXTERNAL ASSESMENT (EXAM)		
	L	T	P	THEORY PAPERS	PRACTICALS PAPERS	WRITTEN PRACTICALS		
				MAX. MARKS	MAX. MARKS	MAX. MARKS	MAX. MARKS	
Applied Science	5	-	-	25	--	75	--	100
Communication Skill	--	--	2	15	10	75	--	100
Engineering Drawing	--	--	8	--	25	75	--	100
Basic Principles Of applied Mechanics	4	--	2	15	10	75	25	125
General Workshop Practice	--	--	8	--	50	--	100	150
Computer Application-I	1	1	4	15	10	50	25	100

## SEMESTER-II

SUBJECT	STUDY SCHEME			EVALUATION SCHEME				TOTAL MARKS
	HRS/WEEK			INTERNAL ASSESMENT		EXTERNAL ASSESMENT (EXAM)		
	L	T	P	THEORY PAPERS	PRACTICALS PAPERS	WRITTEN PRACTICALS		
				MAX. MARKS	MAX. MARKS	MAX. MARKS	MAX. MARKS	
Engineering Drawing-II	--	--	8	--	25	75	--	100
Aircraft Elements	3	1	2	15	10	75	25	125
General Engineering	6	1	3	25	25	75	25	150
General Workshop Practice-II	--	--	8	--	50	--	100	150
Aircraft Rules and Regulations	3	--	1	25	--	75	--	100

**SEMESTER-III**

SUBJECT	STUDY SCHEME			EVALUATION SCHEME				TOTAL MARKS
	HRS/WEEK			INTERNAL ASSESMENT		EXTERNAL ASSESMENT (EXAM)		
	L	T	P	THEORY PAPERS	PRACTICALS PAPERS	WRITTEN PRACTICALS		
				MAX. MARKS	MAX. MARKS	MAX. MARKS	MAX. MARKS	
Mechanical Engg.	--	--	8	--	50	75	--	125
Flight Mechanics	3	--	2	15	10	75	25	125
General Workshop Practice-III	--	--	8	--	50	--	100	150
Aircraft Rules & Regulation-II	3	--	1	25	--	75	--	100
Basic and Digital Electronics	3	--	2	15	10	75	25	125
Power plant Construction	4	--	2	15	10	75	25	125

**SEMESTER-IV**

SUBJECT	STUDY SCHEME			EVALUATION SCHEME				TOTAL MARKS
	HRS/WEEK			INTERNAL ASSESMENT		EXTERNAL ASSESMENT (EXAM)		
	L	T	P	THEORY PAPERS	PRACTICALS PAPERS	WRITTEN PRACTICALS		
				MAX. MARKS	MAX. MARKS	MAX. MARKS	MAX. MARKS	
Aircraft Materials & Process	4	--	2	15	10	75	25	125
Aircraft Instrument-I	2	--	3	15	10	75	25	125
Aircraft Structure	4	--	2	15	10	75	25	125
Power plant System	4	--	2	15	10	75	25	125
Aircraft System-I	3	--	1	15	10	75	25	125
Maintenance Concept and Practices-I	3	--	2	15	10	75	25	125
Minor Project work	--	--	4	--	50	-(viva)	50	100

\*it will be preferred to organize minor project work in industrial situations where students are asked to observe industrial practices and prepare their projects under the guidance of their teachers. in case, if it is not possible to place students in actual work situation, efforts should be made to simulate industrial conditions in the polytechnics laboratories/workshops and other suitable places to provide relevant experiences.

SEMESTER-V									
SUBJECT	STUDY SCHEME			EVALUATION SCHEME				TOTAL MARKS	
	HRS/WEEK			INTERNAL ASSESMENT		EXTERNAL ASSESMENT (EXAM)			
	L	T	P	THEORY	PRACTICALS	WRITTEN	PRACTICALS		
				PAPERS	PAPERS				
				MAX. MARKS	MAX. MARKS	MAX. MARKS	MAX. MARKS		
Aircraft Instruments-II Computer	1	--	2	15	10	75	25	125	
Applications-II Testing and Measurement	1	1	2	15	10	50	25	100	
Aircraft System-II Maintenance Concept And practices-II	2	1	1	15	10	75	25	125	
Advance Airframe Structure-I	4	--	2	15	10	75	25	125	
Advance Propulsion Gas Turbine Engine Construction	3	--	5	15	10	75	50	150	
	3	--	2	15	10	75	25	125	
	4	--	2	15	10	75	25	125	

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**SEMESTER-VI**


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SUBJECT	STUDY SCHEME			EVALUATION SCHEME				TOTAL MARKS
	HRS/WEEK			INTERNAL ASSESMENT		EXTERNAL ASSESMENT (EXAM)		
	L	T	P	THEORY PAPERS	PRACTICALS PAPERS	WRITTEN PRACTICALS		
				MAX. MARKS	MAX. MARKS	MAX. MARKS	MAX. MARKS	
Aircraft System-III	4	--		25	--	75	--	100
Maintenance Concept & Practices-III	4	--	5	15	10	75	50	150
Industrial Engineering	4	--	--	25	--	75	--	100
Advance Airframe Structure-II	3	--	2	15	10	75	25	125
Advanced Propulsion Gas Turbine engine Maintenance	3	--	3	15	10	75	25	125
Major Project work	--	--	8	--	100	--	100(viva)	200

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\*it is proposed that the students should be sent to industry for a period of about two months at a stretch. Before the final examination under the guidance of teachers. During this period, students should be given shop floor related industrial problems. Teachers of the department will find out suitable problems of interest to industry and that of students. Each teacher will guide 6 to 8 students for project work.

## APPLIED SCIENCE

	L	T	P
HRS/Week	5	-	-

### RATIONALE

The Subject deals with basic concepts. Principles and application of physics and chemistry as applied to Aeronautical and Aircraft Maintenance. These principles will be helpful in understanding technology subjects.

### DETAILED CONTENTS

- 1. Units and dimensions** 8Hrs.  
Fundamentals and derived units in S.I.System. Dimensions of physical quantities. Principle of homogeneity. Dimensional equations. Application of dimensional analysis:
  - a) Checking the correctness of physical equations.
  - b) Derivation of simple physical relations, and
  - c) Conversion of units. Limitations of dimensional analysis
- 2. Force and motions** 10Hrs.  
Scalar and vector quantities, force and its unit, composition and resolution of forces (composition by parallelogram law and by the method of components). Newton's law of motion under the action of forces, motion on horizontal plane and inclined plane. Parabolic motion, horizontal projection and projection at an angle (problems on time of flight. Horizontal range and maximum horizontal range) Central forces, circular motion of bodies. Angular velocity, Uniform angular acceleration. Relationship between linear and angular velocity. Centripetal and centrifugal forces, Centripetal acceleration and centrifugal forces, centripetal acceleration. Bend of a cyclist. Law of conservation of momentum and its applications.
- 3. Work, Power and Energy** 8Hrs.  
Work and its units. Work done on bodies moving on horizontal and inclined planes( consider frictional forces also) concept of power and its unit. Calculation of power (Simple cases). Concept of kinetic energy and potential energy. Expressions of freely falling bodies. Principle of conservation of energy.
- 4. Rotational Motion** 8 Hrs.  
Concept of rotational inertia(mass moment of inertia) Analogy between the parameters in rotational and translational motion (such as displacement, velocity, acceleration, mass force, work, K.E., Power and momentum). Torque and angular momentum and their inter relationship. Rolling as a combination of rotational and translational motion.
- 5. Heat** 12 Hrs.  
**5.1 Temperature and its measurement**  
Concept of heat and temperature on the basis of K.E., of molecules. Units of heat. Basic principles of measurements of temperature, (Thermo couple, thermometer, bimetallic and resistance) Ranges of these thermometers. Criteria for the selection of a thermometer.

## 5.2 Expansion of solids and fluids

Coefficient of linear, surface and cubical expansions and relations amongst them. Thermal stresses (Qualitative only)

## 5.3 Heat Transfer

Three modes of transfer of heat. Coefficient of thermal conductivity. Conduction through compound media (Series and parallel for two material only) Radiation. Characteristics of heat radiation. Prevost's theory of heat exchange. Black body radiations. Emissivity and absorptivity. Kirchhoff's law. Stefan's law of radiation.

## 6. Metallurgy

General principles of extracting metals from their ores. Metallurgy of copper, aluminum and iron with their properties and uses. Manufacture of steel by

- a) Bessemer's process and
- b) Open hearth process ferrous and non ferrous alloys

## 7. Corrosion 8 Hrs.

Its meaning, theories of corrosion, prevention of corrosion by various methods.

## 8. Fuels and their classification 7 Hrs.

Proximate and ultimate analysis. Estimation of moisture. Volatile, ash, fixed carbon and calorific value determination of calorific value. Determination of calorific value by Bomb calorimeter.

## 9. Lubrication 8 Hrs.

Principles to lubrication. Characteristics of lubrication such as viscosity, oiliness, acid value and emulsification flash point and fire point, pour point, saponification, types of lubricants, their properties and uses, liquid (mobile oil), semi solid (grease) and solid types (Graphite)

## 10. Paints and varnishes 3 Hrs.

Drying oil, pigment, drier, thinner, painting technique, defects in painting.

## COMMUNICATION SKILLS

	L	T	P
Hrs/Week	1	-	2

### RATIONALE

Diploma holders are supposed to communicate verbally and in writer forms. Further technical report writing forms another essential requirement of these people. Keeping in view above requirements. This subject has been added to develop necessary competencies in written and oral communication. Efforts should be made to give practice of communication to the students.

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	One way and two way communication	1		
2.	Essentials of good Communication	1		
3.	Methods of Communication oral, Written and non-verbal	1	Practical session Oral communication by Means of seminars, debates And context.	
4.	Barriers to Communication	1		
5.	Techniques of Overcoming barriers	1		
6.	Concept of effective Communication	1		
7.	All form of written Communication including drafting Of reports, notices, agenda notes, Business correspondence, Preparation of summaries and précis, Telegrams, circular, representations, Press release and advertisements	3	Practice of writing Official business and personnel letters on each of the items give in section 7	8
8.	Telephonic communications	1	Practice of handling Telephone Communication	3



9.	Essentials of Technical Report writing. Defect Reporting. Analysis and how to Make suggestions	2	Practice of Technical report writing	5
10.	Writing personnel resume And application for a job	2	Practice of writing personal bio-data and Writing application for a job	4
11.	Techniques of conducting Group discussions		Practice session on group discussion	6
12.	International phonetics Of alphabets and numerals	1		

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## ENGINEERING DRAWING-I

	L	T	P
Hrs/week	-	-	8

### RATIONALE

Engineering drawing known as the language of engineers is a widely used means of communication among the designers, engineers, technicians, draftsmen and craftsmen in the industry. The translation of ideas into practice without the use of this graphic language is really beyond imagination. The diploma holder is required to read and interpret the designs and drawings, provided to him for actual execution of the job. This courses and other allied subjects.

### DETAILED CONTENTS

**Note: IS & Joint service specification (JSS) should be followed.**

1. Free hand sketching
  - a) Introducing drawing by free hand sketching 1 Sheet
  - b) Different types of lines and material breaks. 6 Hrs.
2. Lettering technique and practice
  - a) Free hand lettering and numerals in 1 Sheet  
3, 5.8 and 12mm series vertical and 12 Hrs.  
Inclined at 75
  - b) Instrumental single stroke lettering in 20 mm.
3. Principles of projection (third angle projection)
  - a) Principles of orthographic projections. 1 Sheet
  - b) Three views of a given object. 12 Hrs.
  - c) six views of a given object 1 Sheet  
12 Hrs.
  - d) Some shapes of inclined surfaces 1 Sheet
  - e) Identification of surfaces from different objects. 12 Hrs.
  - f) Introduction to 1<sup>st</sup> angle projection
4. Dimensioning technique and requirements of views
  - a) Necessity of dimensioning 1 Sheet
  - b) Methods and principles of dimensioning 8 Hrs.
  - c) Requirement of views for complete dimensioning
5. Section
  - a) Importance 1 Sheet
  - b) Method of representing the section 12 Hrs.
  - c) Conventional sections for various materials
  - d) Classification of sections
  - e) Conventions in sectioning

- |    |   |                    |
|----|---|--------------------|
| 6. | Pictorial/isometric views                 |                    |
|    | a) Pictorial view from two or three views | 3 Sheet            |
|    | b) Isometric views of simple objects      | 36 Hrs.            |
|    | c) Exercise on missing views and lines    |                    |
| 7. | Elementary Working Drawings               |                    |
|    | a) Scales                                 | 1 Sheet<br>8 Hrs.  |
|    | b) Working drawing by actual measurement  | 1 Sheet<br>10 Hrs. |

## BASIC PRINCIPLES OF APPLIED MECHANICS

	L	T	P
Hrs. /Week	4	-	2

### RATIONALE

The subject “basic principles of applied mechanics “ deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required to the students for further understanding of other allied subjects. The subjects enhances the method ability of the students.

### DETAILS CONTENTS

1. Laws of forces 15 Hrs.  
Force and its effects, units and measurement of force. Characteristics of force vector representation, Bow’s notation.  
Types of forces, action and reaction, tension, thrust and shear force. Force systems: coplanar and space forces. Free body diagrams.  
Resultant and components of forces, concept of equilibrium. Axioms in statics; parallelogram law of forces. Equilibrium of two forces, law of super-position and transmissibility of forces, Newton’s third law, triangle of forces, different cases of concurrent, coplanar, two forces systems, extension of parallelogram law and triangle law to many forces acting at one point, polygon law of forces, method of resolution for finding the resultant, graphical methods, special case of three concurrent, coplanar forces lami’s theorem.
2. Moments 10 Hrs  
Concepts of moment, varignon’s theorem-statement only. Principle of moments-Application of moments to simple mechanism. Like parallel forces and unlike parallel forces, calculation of their resultant concept of couple, properties and effect. Moving a force parallel to its line of action.  
General cases of coplanar force system. General conditions of equilibrium of bodies under coplanar forces.
3. Friction 6 Hrs.  
Concept of friction, law of friction; limiting friction and coefficient of friction. Sliding friction and rolling friction.
4. Centre of Gravity 6 Hrs.  
Concept of gravity, gravitational force, centroid and centre of gravity. Centroid for regular laminas and centre of gravity for regular Solids. Position of centre of gravity of compound bodies and centroid of composite area. CG of bodies with portions removed.
5. Laws of Motion 8 Hrs.  
Concept of momentum, Newton’s laws of motion, their application. Derivation of force equation from second law of motion. Numerical problems on second law of motion. Piles, lifts, bodies tied with string

Newton's third law of motion numerical problems, conservation of momentum, impulse and impulsive force (Definition only)

- |    |   |        |
|----|---|--------|
| 6. | Simple Machines<br>Concept of machine, mechanical advantage, velocity ratio and efficiency of a machine, their relationship laws of machine . Simple machines (Lever, wheel and axle, pulleys, jacks with crabs only)   | 6 Hrs. |
| 7. | Stress and strains<br>Concept of load, stresses and strains. Tensile compressive and shear stresses and strains. Tensile compressive and shear stresses and strains. Concept of Elasticity, Elastic limit and limit of proportionality. Hook's law. Young modulus of elasticity. Yield point, plastic stage. Strain hardening. Ultimate strength and breaking stress. Percentage elongation. Proof stress and working stress. Factor of safety shear modulus. | 6 Hrs. |
| 8. | Moment of Inertia<br>Concept of moment of inertia and second moment of area. Radius of gyration. Second moment of area of common geometrical sections: Rectangle, Triangle, Circle (without derivation). Second moment of area L,T and section modulus.   | 8 Hrs. |

### **PRACTICAL EXERCISES**

- |    |   |         |
|----|---|---------|
| 1. | Tensile test on bars of mild steel and aluminum and finding stress, strain and young's modulus. | 12 Hrs. |
| 2. | Shear test on specimen of two different metals.   | 8 Hrs.  |
| 3. | Hardness test on metal and finding the brinell's, Rockwell's hardness.                          | 8 Hrs.  |

## GENERAL WORKSHOP PRACTICE-I

	L	T	P
Hrs./Week	1	-	2

### RATIONALE

The Subject is gateway to the technological/industrial processes. The mental and manual abilities will be developed to handle engineering materials with hand tools with quality and safety consciousness. The elementary abilities developed in carpentry. Fitting machine welding sheet metal and electric shop will find applications in other semesters. The emphasis given on practical work will provide the students the primary experience of working in team, details of practical works carpentry shop 40 Hrs 1 introduction to hand tools.

### DETAILS OF PRACTICAL WORKS

#### CARPENTRY SHOP

**40 Hrs.**

1. Introduction to hand tools (2 Hrs.)
2. Marking and sawing practice (8Hrs.)
3. Planning practice (6 Hrs.)
4. Chiseling practice (6 Hrs.)
5. Preparation of half lap joint (3 Hrs.)
6. Preparation of mortise and tenon joint (6 Hrs.)
7. Preparation of miter joint (3 Hrs.)
8. Preparation of dovetail joint and glued joint (3 Hrs.)
9. Practice of handling circular saw (3 Hrs.)

#### FITTING SHOP

**46 Hrs.**

1. Introduction to fitting tools (2 Hrs.)
2. Filing practice and production of flat surface and checking by straight edge (6 Hrs.)
3. Filing a dimensioned rectangular or square piece to an accuracy of +0.25mm (6Hrs.)
4. Chipping practice (6 Hrs.)
5. Hack sawing practice (6 Hrs.)
6. Drilling practice on soft metals (3Hrs.)
7. Practice of filing on nonferrous metals (4 Hrs.)
8. Tapping practice (6Hrs.)
9. Preparation of some utility job (10 Hrs.)

#### WELDING SHOP

**42 Hrs.**

1. Introduction of welding and its importance types of welding, materials that can be welded (2Hrs.)
2. Gas welding –theory (2Hrs.)
3. Practice in handling welding equipment (3 Hrs.)
4. Gas welding practice ( 6Hrs.)
5. Preparation of butt joint by gas welding ( 6 Hrs.)
6. Electric arc welding- theory (1 Hrs.)
7. Welding practice by arc welding ( 6 Hrs.)
8. Preparation of various types of joints by using arc welding ( ^ Hrs.)
9. Preparation of utility job ( 10 Hrs.)

## COMPUTER APPLICATION-I

	L	T	P
Hrs./week	1	1	4

### RATIONALE

Computers not only represent modern technology application but also are very important from the point of their usefulness to students during and after the course.

The level of knowledge in computers should be such that all students are able to use the machine, calculation, data application and text processing.

The second phase of the course is directed towards computer aided design and manufacturing techniques.

Students should be able to carry out computer drafting of technical designs, retrieve old drawings for interpreting. They should also be able to store and retrieve information as regard tools, documents and inventory

Sr. No.	Theory	Time	Practical	Time
1.	Computer construction And connections	1	Connect and disconnect pc	2
2.	Disk operating system (DOS) Basics	1	Practice of commands	4
3.	DOS usage commands	2	Practice of DOS Commands	6
4.	Text processor Theory and commands	2	World star and world practice	10
5.	Use of spread sheet Basics and formula	2	Text processing command practice	10
6.	Statistics and Data base basics Database III	4	Practices Database III	14
7.	Knowledge of peripherals Mouse scanner printer	2	Practice on mouse	4
8.	Programming in Basic	2	Practice in programming Writing	10

## 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.	

## MECHANICAL ENGINEERING DRAWING

	L	T	P
Hrs./Week	-	-	8

### RATIONALE

Diploma holders in Aeronautical And Maintenance Engineering are required to read and interpret drawings and thereof, it is essential that they have skills of preparing drawings and sketches of various components, tools, jigs and Fixtures. For this purpose, knowledge and skills for preparing drawings of couplings, bearing, bracket, pulleys, pipe joint and I.C. Engine parts are required to be imparted for enabling them to work in the field of Aeronautics. This subject aims at development of drawing competencies in the students aims at development of drawing. Stress should be laid on layout, cleanliness, conceptualization, dimensions and specifications.

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	COUPLINGS	2 Sheets		
	1.1 Universal Coupling	10 Hrs.		
	1.2 Oldham's Coupling			
2.	BEARINGS	5 Sheets.		
	2.1 Simple bushed bearing	30 Hrs.		
	2.2 Ball bearing and roller bearing			
	2.3 Plummer block (detailed drawing)			
	2.4 Plummer block (assembled drawing)			
	2.5 Foot step bearing			
3.	BRACKET	1 Sheet		
		6 Hrs.		
3.1	Wall Bracket			
4.	PULLEYS	2 Sheets		
		10 Hrs.		
4.1	Fast and loose pulley			
4.2	Stepped and V-Pulley			
5.	PIPE JOINT	3 Sheets		
		18 Hrs.		
5.1	Flanged pipe joints, right angle bend			
5.2	Hydraulic pipe joints, spigot and socket join.			



5.3	Expansion pipe joints.	
5.4	Practice of blue print reading on brackets. Pulleys and pipe joints	
6.	SCREW JACK	1 Sheet 6 Hrs.
7.	ENGINE PARTS 15 Hours	4 Sheets
7.1	Aircraft piston, connecting rod, valve mechanisms	
7.2	Crankshaft and fly wheel assembly	
7.3	Linkages	
8.	DRAWING A AIRCRAFT PARTS 20 Hrs.	
8.1	Aerofoil's and NACA	
8.2	Wing ribs and body ribs	
9.	GEARS 12 Hrs.	2 Sheets
9.1	Use of different types of gears	
9.2	spur gears with actual profile Of involutes teeth.	
9.3	Conventional representation of Bevel gears, worm and worm wheel.	
9.4	Introduction to bevel gears.	
10.	Practice of reading drawings.	

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## FLIGHT MECHANICS

	L	T	P
Hrs./Week	3	1	1

### RATIONALE

An aircraft is capable of flying in spite of its large weight. It has particular shape and becomes airborne beyond certain speeds. In order to appreciate the principles involved in flying it is essential to gain knowledge and skill in the area of mechanics of fluids applied to flying.

Instructors are recommended to design simple suitable tutorial problems and carry out experimental work in the laboratory for better understanding of principles of flight mechanics.

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Introduction to Fluid mechanics	6	To study flow having viscosity effects and to Study pressure distribution on Immersed bodies	2
1.1	Fluid properties: Pressure, density, relative Density, specific weight, Viscosity, compressibility, Surface tension			
1.2	Types of fluids and flow Regimes		To draw standard atmospheric charts using pressure density Relations for different ranges Of atmosphere.	2
1.3	Standard atmosphere And its characteristics, Aero thermodynamics			
2.	Flow kinematics	8		
2.1	Introduction, streamlines, Path lines and streak lines, Acceleration			
2.2	Euler's equation			
2.3	Bernoulli's equation		Draw Bernoulli's Equation terms for Flow through a ventruimeter	
2.4	Vortex motion			

3.	fluid Dynamics	3		
3.1	Momentum equation For flowing fluid			
3.2	Non-dimensional Numbers, Reynolds; Number, mach number, coefficients of Lift, drag and moments			
4.	Flight aerodynamics	10	To draw different Kinds of aerofoil	2
4.1	Introduction to 2-D Aerofoils and their Geometrical Parameters; chord, Thickness ratio, Camber, mean camber line, angle of attack; Aerofoil characteristics		And show geometrical parameters and to perform experiment on flow	
4.2	Magnus effect and Vortex theory, lift And drag on inclined Plates		to draw lift-drag curve and pressure distribution for a given set of data	
4.3	lift –drag relation, Types of drag high Drag devices, boundary Layer fence, super stall Load and factors.			
4.5	Pressure distribution and Centre of pressure			
5.	Aircraft performance	7	Estimate parameters For straight and level flight	
5.1	Straight and level powered Flight			
5.2	Gliding flight			
5.3	Knowledge of effect Of altitude, weight and engine Power on aircraft performance/ Minimum drag, minimum Power, stalling and sinking speeds time Of descent and climb, maximum climb rate.			

6.	High speed flows	6		
6.1	Governing equations and Significance of mach number		Study of high speed aerofoil and draw Flow pattern	2
6.2	sonic flows, sound barrier and Shock waves: normal and oblique			
6.3	General shape of supersonic Aerofoil's			
7.	Wind tunnels introduction, Types, components and use & its errors	3	to draw different subsonic wind tunnels and associated basic Instrumentations.	2
8.	Aircraft stability rolling, pitching, Yawing, primary and Secondary controls.	5		

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## GENERAL WORKSHOP PRACTICES-III

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

### DETAILED CONTENTS

Advanced Machine shop	45 Hrs.
1. External and internal threading Exercise (10Hrs.)	
2. Generation of flat surface on milling machine (10Hrs.)	
3. Gear cutting on Milling ( 15 Hrs.)	
4. Exercise on grinding machines ( 10 Hrs.)	
Painting Shop	35 Hrs.
1. Painting and coating Exercise (10 Hrs.)	
2. Spray painting exercise (10Hrs.)	
3. Electroplating and buffing a component (15 Hrs.)	
Advance Welding Shop	35 Hrs.
1. Brazing and soldering exercise (8 Hrs.)	
2. Spot and seam welding exercise (7 Hrs.)	
3. Exercise do TIG/MIG welding (10 Hrs.)	
4. Metal pipe cutting, bending and flatting processors (10 Hrs.)	

## AIRCRAFT RULES AND REGULATIONS-II

	L	T	P
Hrs./Week	3	-	1

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Stores: Bonded and Quarantine stores, Storage of various Aeronautical products Including rubber goods, Various fluids.	6	Visit to stores and identification of the areas	6
2.	Knowledge of various Terms such a certificate Of flight release, certificate of Maintenance, approved Certificate.	2		
3.	Condition under Which aircraft is required to be Test flown certificate to be issued By AME for test flight	4		
4.	Circumstances under Which C of A is required	3		
5.	Ferry flight, MEL CDL	3		
6.	Minimum equipment, Instruments required for Various types of operation			
7.	Modification, concession, Airworthiness	10	to see some of the modes/ AD s /SB s on the aircraft	3
8.	Approval of organization	6		
9.	Documents required To be carried on board	2	To physically check and see the documents	
10.	Issues of type approval	2		
11.	Registration Authority	2	To physically check and identify making.	2

## BASIC AND DIGITAL ELECTRONICS

	L	T	P
Hfrs./Week	3	-	2

### RATIONALE

Diploma holders in Aircraft Maintenance should have knowledge and skills about electronics instruments being used on the aircraft. Hence this subject.

### DETAILED CONTENTS

1. Review of Resistor, inductor, capacitor, and transformer, series and parallel combination of R,L and C 3 Hrs.
2. Concepts of semiconductors, impurities and conduction intrinsic, and extrinsic. PN junction as a diode its characteristics and application as rectifier, temperature dependence of diode characteristics. 7 Hrs.
3. Transistor and its characteristics in different configurations; FET and MOSFET construction and characteristics, Biasing of BJT and FET. 3 Hrs.
4. Concept of amplifier, its effect on gain (in db) input and output, impedances, bandwidth, multi stage amplifiers (Qualitative analysis) 5 Hrs.
5. Feedback in amplifier, its effect on gain, band width input and output impedances, and noise. Positive feedback and oscillators' (RC LC and crystal type).
6. Operational Amplifiers, its characteristics and application as adder inverter, integrator differentiator, comparator 2 Hrs.
7. Current through RL and RC circuits, transistor as a switch with different loads, definitions of AND, or NOT NAND, NOR XOR gates specifications of TTL and CMOS logic gates. Truth tables and logic expressions, tristate buffer (Only concept) simple problem solving using gates, Boolean's expression. 7 Hrs.
8. Review of number systems and their conversions (Decimal, binary and Hexadecimal) 3 Hrs.
9. Binary arithmetic (1's and 2's complement), half adder, half subtracted, full adder/full subtracter)3Hrs.
10. Latches, flip/Flops (Various types) counters and registers. 3 Hrs.
11. Multiplexer/Dee multiplexer, encoder/Decoder. 2 Hrs.
12. LED/LCD displays, timer chip 555. 2 Hrs.
13. Concept of memories-ROM and RAM. 3 Hrs.

## **PRACTICALS**

1. p-n Junction diode characteristics and its use as half wave and full wave rectifier (2 Hrs.)
2. Common collector and common drain characteristics of NPN transistor. (2 Hrs.)
3. Common source and common drain characteristics of FET. (2 Hrs.)
4. Single stage transistor amplifier and measurement of current and voltage gains and band width. (2 Hrs.)
5. R-C phase shift oscillator and measurement of its output voltage and frequency of oscillation. (2 Hrs.)
6. Operational amplifier circuit as adder, sign changer, integrator, differentiator, comparator, (2 Hrs.)
7. Transistor as switch characteristics with resistance and capacitance loads. (2 Hrs.)
8. Verification of truth tables of AND, OR, NOT, XOR, NAND, NOR GATES. (2 Hrs.)
9. Implementation of full adder using NAND/NOR gates. (2 Hrs.)
10. Implementation of decade counter using JK flip flops and observations of outputs. (2 Hrs.)
11. Shift left/right 4 bit shift register realization and observations of outputs. (2 Hrs.)
12. Use of multiplexer and demultiplexer for 4 inputs/outputs. (2 Hrs.)
13. Operation of 3 to 8 decoder and observation of output. (2 Hrs.)
14. Operation of 555 chip as non stable and a stable multivibrator. (2 Hrs.)
15. Operation circuit for 7 segments LED display. (2 Hrs.)
16. Operational circuit for 7 segments LCD display. (2 Hrs.)



## POWER PLANT CONSTRUCTION-PISTON ENGINES

L	t	P
Hrs. /Week 4	-	2

### RATIONALE

Power plant is the heart of any system. It is true for various aircraft also. The diploma holders in Aircraft Maintenance must know about the constructional aspects and about various systems of the power plant in the piston engine. Hence this subject has been divided into two sections. First deals with the construction and the other deals with the power plant system. Which will be covered in 4<sup>th</sup> semester.

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Familiarization with different types Of engines such as piston Engines and gas Turbine engine	2		
1.1	Internal combustion heat engines Two stroke and four stroke, inline Radial and opposed engines	2		
2.	Definitions and terms used in Piston engine and classification of engine.	2		
3.	Power and efficiency, their Calculations	2		
4.	Fundamentals requirements construction, Classification material and components And accessories of engine	25	dismantling of engine components and accessories	8
5.	Valve operating mechanism, Its parts, valve timing valve Clearance their checking And adjustments , instruments And tools used	8	Carrying out the valve timing, checking the timings, valve clearance and adjustments	8

6.	Propeller theory, different types of propeller Used, their construction, Operation maintenance and Trouble shooting - Removal and Installations procedure - De-icing anti-icing and Synchronization systems - Propeller balancing, tracking - Propeller governors.	16	Propeller removal and installation - Adjusting propeller Governors controls -Balancing the propeller - Track checking the propeller
6.1	Engine Instruments		
7.	Power /thrust boosting Devices like water injection, Super charger, turbocharger, Their construction, operation and Maintenance	5	Dismantling the super charger 2 and turbocharger,
8.	Fuels, oils contamination And prevention	2	Taking fuel samples 2

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## AIRCRAFT MATERIALS AND PROCESSES

	<b>L</b>	<b>T</b>	<b>P</b>
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 components of measure and location of components	4
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			

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## 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

	<b>L</b>	<b>T</b>	<b>P</b>
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 Definition	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%
		-----
		100
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## AIRCRAFT INSTRUMENTS II

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

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Gyro Instruments	2	Identification removal and Fitment	6
2.	AC Compass	2	Removal and fitment	4
3.	Landing compass and Compass swinging	1	Compass swinging procedure	4
4.	Alerting and indicating Instruments	3	Testing and servicing of instruments	2
5.	Weather Radar	2		
6.	Air Data Bus	1	Identification of parameters And transducers for data Integration	2
7.	CVR, CDR and FDR	3	Data milking of FDR, Removal And fitment of FDR and CVR	6
8.	Auto Pilot and Automatic Control	2	Removal and fitment of automatic control components	4

## COMPUTER APPLICATIONS II

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

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Overview of computer application	2	Hand on practices	1
2.	Engineering computation and Simulation	2	Usage of computer in engineering application	2
3.	Real time measurement and control	2		
4.	Cad/Cam/Cae	7	Hand on practice in Auto CAD Drawings	18
5.	Data input and retrieval for Component inventory control	2	Practice in data	10
		31		15

## TESTING AND MEASUREMENT

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

### RATIONALE

Persons working and doing maintenance job on and aircraft are often involved in carrying out recommended tests. Which require expertise in measurement techniques and data analysis. Knowledge of various measurement devices, their usage and data processing becomes important.

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Introduction to methods of Measurement : mean, median, mode.	1		
1.1	Fundamental methods of Measurement general instrument Terminology, conversion of Measuring unit from one system to Another	2		
1.2	Measurements and their accuracy, reliability, Sensitivity and reproducibility, calibration	2		
1.3	Data presentation: Discrete, histogram, Continuous	3	Draw histogram for a given set of measurements find mean mode and median.	2
2.	Analysis of experimental data Accuracy and precision	4	for time period of a pendulum find all pendulum find all precision	
3.	Measurements of following physical quantities.			
3.1	Displacement Mechanical, Electrical And optical systems	2	To find characteristics of a LVDT	2
3.2	Force and torque Mechanical, elastic, Cell, dynamometers	3	To determine characteristics of an electric motor using dynamometer	2
3.3	Pressure mechanical, Manometers, transducers, low and high Pressure measurements	3	Calibration of a pressure gauge	2
3.4	Temperature: thermo-mechanical Electrical calibration	4	Cooling characteristic using thermocouple	2
3.5	Strain strain-gauge Theory types calibration	4	Strain gauge measurements of deflection of beam	2
3.6	Flow velocity and flow rate: Mean velocity, pressure-probes and calibration, Orifice Nozzle, venturi and rota meters.	4	Performance of venturimeter	2



## AIRCRAFT SYSTEM-II

**L**     **T**     **P**  
**Hrs./Week**   **4**     **-**     **2**

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Air conditioning System	16		
1.1	Concepts			
1.2	Need of air conditioning			
1.3	Study of schematic diagram of Typical air conditioning System		Demonstration of air conditioning system on the aircraft to trace out various items with Associated piping	6
1.4	Basic elements of air conditioning System			
-	Cold air unit			
-	Heat Ex changer			
-	Pressure control valves			
-	Temperature control valves			
-	water Extractor			
1.5	Hearing and ventilating systems			
2.	Pressurization system	14	Demonstration of pressurization System on the aircraft	6
2.1	Concepts			
2.2	Why pressurization? Pressurization			
2.3	Study of schematic Diagram of typical pressurization			
2.4	Basic elements of pressurization system			
-	Pressure controller			
-	Discharge valve			
3.	Fuel System	6		
3.1	Basic principle			
3.2	Study of schematic Diagram of a typical Diagram of a typical Fuel system		Study of the fuel system on the aircraft and to trace out various items associated with piping	6

3.3	Basic elements of fuel system		
-	Mechanical booster		
-	Valves		
-	Fuel content sensors and gauging		
4.	Electrical system (power generation) and Distribution		
4.1	Concepts		
-	AC system (Constant and fixed speed)		
-	DC System	24	Study of the AC and DC system on trace out 6 various items with associated cables.
-	Inverters		
4.2	Study of schematic diagram of a typical AC system		
4.3	Study of schematic diagram of a typical DC system		
4.4	Basic elements of AC system		
-	AC generator		
-	Control and protection unit		
-	Indicating and warning devices		
4.5	Basic elements of DC system		
-	DC Generator control and Protection unit		
-	Battery and APU		
-	External power , GPU		
-	Indicating and warning devices		
5.	Miscellaneous systems	4	
5.1	Safety and Emergency	4	
-	Fire protection, Detection and extinguishing		Demonstration of the systems On aircraft
-	Oxygen system		6
5.2	Escape system		
5.3	Aircraft furnishing		

## MAINTENANCE CONCEPT AND PRACTICES-II

**L**     **T**     **P**  
**Hrs./Week**     **3**     **-**     **5**

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	General repair Methods including Salvage methods	10		
1.1	Welding		Various methods of TIG/MIG Welding	12
1.2	Patching			
1.3	Riveting		Gluing and patching	
1.4	Gluing and plywood repair			
1.5	Plating			
1.6	Non-Destructive methods(NDT)			
2.	Methods	12		
2.1	Shop layout Conditions and services			
2.2	Task preparation and proving			
2.3	Task routine			
2.4	Material handling			
3.	Aircraft and its various Systems	20		
3.1	Assessing the physical condition of Airframe		Study of maintenance manual of any aircraft	10
3.2	Assessment of a repair as called for by Maintenance manual			
3.2.1	in Situation assessment of Condition of power plant		Study of maintenance manual of piston engine and jet engine	10
3.2.2	Removal of engine from airframe		Practice on assessment of engine Condition and its removal from airframe	8
3.3.2	Repair by replacement Of engine and salvage It system components		Practice on repair and salvage of engine and its components	8

4.	Hydraulic system pumps, Pipelines testing and repair	4	Repair and testing of hydraulic system	12
5.	Landing gear (LG)	1		
5.1	Assessment of condition Of various components of LG		identifying different types and its components	2
5.2	Rectify /Replace/Repair/ Adjustment of LG systems/its Components		practice on repair/ replacement and adjustment of LG system	8

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## ADVANCED AIRFRAME STRUCTURE-II

L     T     P  
Hrs./Week 3     -     5

### RATIONALE

A Diploma holder must have knowledge about construction of aircraft structure i.e. fuselage, wings tailplane and empennage and other control surfaces. Hence this subject has been divided into week sections. The second section will be covered in 6<sup>th</sup>. Semester.

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Types of aircraft Construction	2	Demonstration of major aircraft structures	2
1.1	Metal construction			
1.2	Wooden Construction			
1.3	Composite construction			
2.	Various loads taken by Aircraft during flight	3	Load testing on universal testing machine	2
2.1	Compression; tension; Torsion; shear; bending			
3.	Construction of fuselages	10	Demonstration of Various fuselages	4
3.1	Truss type fuselage			
3.2	Mono coque and semi mono coque fuselage			
3.3	Terminology for fuselage			
4.	Construction and method of attachment Of wings	9	Demonstration of various main plane construction	4
4.1	Terminology relating to Wing construction			
4.2	Stressed skin construction			
4.3	Braced construction			
4.4	Geodetic construction			
5.	Construction of empennage	4	method of attachment	2
5.1	Construction of tail plane			
5.2	Construction of fin			

6	Construction and method Of attachment of primary Flying control surfaces	8	Demonstration and adjustment of control surfaces	5
6.1	Ailerons			
6.2	Elevators			
6.3	Rudder			
6.4	Rudder vators			
6.5	Elevons			
7.	Construction and method Of attachment of secondary And aircraft control surfaces	12	Demonstration of secondary and auxiliary control surfaces	8
7.1	Tabs			
7.2	Trim tabs			
7.3	Balance tabs			
7.4	Servo tabs			
7.5	Spring tabs			
7.6	Flaps		minor and major repair Of aircraft structure of metals, Fabric and wood	5
7.7	Slats and siots			
7.8	spoilers			
7.9	Airbrakes			

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## ADVANCED PROPULSION-GAS TURBINE ENGINE CONSTRUCTION

	L	T	P
Hrs./Week	4	-	2

### RATIONALE

The diploma holder in aircraft maintenance must have required knowledge and skills about the construction and maintenance of gas turbine engine. Hence this subject has been divided into two sections. The second section will be covered in the 6<sup>th</sup> semester.

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
<b>GAS TURBINE ENGINE CONSTRUCTION</b>				
1.	Definitions and terms Used in the gas turbine engine	2		
2.	Construction and operation of various Types of gas turbine engines such as Turbo fan, turbo prop and turbo shaft Jet engines.	2	Demonstration of working models of gas turbine engines	2
3.	Factors affecting the engine Performance	2		
4.	Principles of combustion	2		
5.	Gas turbine engines: Types . Function and construction Of each part, component and Accessories classify materials.	18	dismantling the engine parts. components and accessories and assembling	
6.	Compressor stall, surge and air bleed Control.	4		
7.	Noise suppressor, thrust reverser and Auxiliary power units	4		
8.	Turbine cooling, air oil systems, Flow mixing and air bleeding for Secondary systems	5		
9.	Fuels and oils, construction and Prevention	5		

## SYSTEMS

- |     |   |   |   |
|-----|---|---|---|
| 10. | Gas turbine engine fuel<br>Systems, including fuel control<br>Unit other parts and components,<br>Their construction and operation  | 4 | Removing and installing<br>the system parts and<br>components |
| 11. | lubrication systems various<br>Types of gas turbine engines, its<br>Parts and components, their<br>Construction and operation   | 5 | Removing and installing of<br>the systems parts and component |
| 12. | Starting system and types<br>Of gas turbine engine starters   | 4 |   |
| 13. | Gas turbine engine thrust augmentation<br>Devices and systems such as water injection<br>System, after burning system adjustable<br>Propelling nozzle i.e. variable nozzle. |   |   |
-



## AIRCRAFT SYSTEM-III

<b>L</b>	<b>T</b>	<b>P</b>
<b>Hrs./Week 3</b>	<b>-</b>	<b>5</b>

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Identification of aircraft cables, Crimping and soldering techniques, Bending continuity and	2	identification of aircraft cables crimping and soldering techniques, bending insulation check	4
2.	series and parallel resonance and Calculations of resonant frequency	2	Tuning of various radio equipment	2
3.	Handling of CRT's weather radar, ESD Microprocessor	2	Handling of CRT's weather radar, ESD, microprocessor	2
4.	Atmospheric layer Around earth, radio wave Propagation	2	Familiarization with various communication and navigation antenna and their maintenance way Contact with	2
5.	Communication system	10	Tower/another aircraft At HF, VHF and use of selcal	10
5.1	VHF			
5.2	HF		use of interphone inside the aircraft	
5.3	Interphone			
5.4	Selcal		Testing of CVR	
5.5	CVR		operation of ELT	
5.6	ELT			
5.7	Navigation system	14	use of ground facilities available At the airport and use of field testers For ground testing	8
6.	Direction finding			
-	ADF			
-	VOR			
6.2	Distance measurement			
-	DME			
-	Tacan			

- 6.3 Grid navigation
  - Omega system
  - Inertial navigation system(INS)
  - Doppla navigation
  - System, GPS

- 6.4 Radar
  - weather radar
  - Radio altimeter

Demonstration on aircraft with emphasis on precaution, health Hazard and aircraft safety

4

- 6.5 Landing aids
  - ILS/MLS
  - ATC Transponder A, C and S
  - GPWS
  - Fans

## MAINTNANCE CONCEPT AND PRACTICES-III

Hrs./Week	L	T	P
	4	-	5

### DETAILED CONTENTS

1.	Aircraft electrical System maintenance	15		
1.1	Generating system		Practical on test routines environmental Testing w.r.t. certain, battery and actuator	14
1.2	Electrical distribution			
1.3	Electrical component Overhaul/requirements		and voltage regulator	
2.	Aircraft instrument system	12		
2.1	Maintenance of measurement systems		Practical on overhaul procedure Altimeter combine temperature And pressure gauge, artificial horizon.	10
2.2	Automatic control system			
2.3	Instrument overhaul practice			
3.	Avionics	7		
3.1	Testing with fault location		practical on repair and testing and any	6
3.2	Overhaul requirements		one of avionics components	
4.	Environmental system	5		
4.1	Oxygen system Condition assessment and Repair /replacement		identify and assess the condition of environmental system components	4
4.2	Air-conditioning system condition Assessment etc.			
5.	Ejection system	4		
6.	Pressurizing system	3		
7.	Fire detection and extinguish system	3		
8.	Modification, their purpose and Embodiment	7	Exercise on modification	
9.	Special tasks	6		
9.1	Standard room			
9.2	Battery room			
9.3	Cable work			
10.	Ground handling equipment	2	Demonstration of various GHE Condition assessment as per user report Repair planning repair assembly weight and Balance document completion and ground Testing of complete aircraft.	2 40

## INDUSTRIAL ENGINEERING PRACTICES

L      T      P  
**Hrs./Week 4      -      -**

### RATIONALE

Industrial engineering practices assume vital importance for a diploma holder in aircraft maintenance. He must appreciate the value of leadership, motivation, human relations, total quality management and environmental engineering. Hence this subject.

### DETAILED CONTENTS

Sr. No.	Contents	Time (Hrs.)
1.	PRINCIPLES OF MANAGEMENT	8
1.1	Management, different functions of management. Planning, organizing, coordination and control	
1.2	Structure of an industrial organizing.	
1.3	Line, function and staff organization	
1.4	Functions of different departments	
1.5	Relationship between individual departments	
2.	HUMAN AND INDUSTRIAL RELATIONS	15
2.1	Human relations and performance in organization	
2.2	Understand self and others for effective behavior	
2.3	Behavior modification techniques	
2.4	Industrial relations and disputes	
2.5	Relation with subordinates, equals and superiors	
2.6	Characteristics of group behavior and trade unionism	
2.7	Mob psychology	
2.8	Grievance, handling of grievances	
2.9	Agitation, strikes, lockouts, picketing and gherao	
2.10	Labour welfare	
2.11	worker's participation in management	
3.	MOTIVATION	5
3.1	factors determining motivation	
3.2	Characteristics of motivation	
3.3	Methods for improving motivation	
3.4	Incentives, pay promotion, rewards	
3.5	Job satisfaction and job enrichment	
4.	Leadership	4
4.1	Need for leadership	
4.2	Functions of a leader	

4.3	Factors to be considered for accomplishing effective leadership	
4.4	Manager as a leader	
5.	HUMAN RESOURCE DEVELOPMENT	
5.1	introductions	
5.2	Staff development and career development	
5.3	Training strategies and methods	
6.	JOB EVALUATION AND MERIT RATING	4
6.1	Objectives and procedure of job evaluation	
6.2	Methods of job evaluation	
6.3	Objectives and methods of merit rating	
6.4	Advantages and disadvantages of merit rating	2
7.	Wage payment	
7.1	Introduction to wages	
7.2	Classification of wage payment scheme	
8.	INDUSTRIAL LEGISLATION	8
8.1	Introduction	
8.2	Importance and necessity of industrial legislation	
8.3	Principles of labour legislation	
8.4	Types of labour laws and disputes	
8.5	The factory Act 1948	
8.6	Payment of wages Act 1923	
8.7	Minimum wages Act 1948	
8.8	workmen's compensation Act 1923	
8.9	Industrial dispute Act 1947	
8.10	Employee's state insurance Act 1948	
9.	ENVIRONMENTAL ENGINEERING	8
9.1	Introduction	
9.2	Ecology	
9.3	Factors causing pollution	
9.4	Effects of pollution on Human health	
9.5	Air pollution and control Act	
9.6	Water pollution and control Act	
9.7	Pollution control equipment	
9.8	Solid waste management	
9.9	Noise and its control	
10.	SAFETY AT WORK PLACES	4
11	ISO 9000 AND TOTAL QUALITY MANAGEMENT CONCEPTS	2

## ADVANCE AIRFRAME STRUCTURE-II

L      T      P  
Hrs./Week 3      -      2

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Under carriages	5	Demonstration of attachment Of under carriage to aircraft Structure	2
1.1	Function of under carriage			
1.2	Types of under carriage			
1.3	Methods of attachment of aircraft			
2.	layout of controls	2	Demonstration of layout of controls	2
2.1	Layout of primary control surfaces			
2.2	layout of secondary control surfaces			
3.	Balancing of controls Surfaces	3	Demonstration of balancing of controls.	3
4.	Aircraft plumbing	10	Practice on cutting of Pipelines, flaring and installation	5
4.1	Metal pipe lines			
4.2	Flexible pipelines			
4.3	Cutting and flaring process of pipelines			
4.4	Process of installation of pipelines			
4.5	Colour coding			
5.	Theory of weight and balance	16	Demonstration of weighing of Aircraft	10
5.1	weighing the aircraft			
5.2	aircraft loading			
6.	Aircraft rigging and symmetry checks	12	Adjustment and alignment of Controls	10
6.1	Leveling of aircraft			
6.2	Leveling of aircraft laterally and longitudinally			
6.3	Rigging of control surfaces			
6.4	Symmetry check of aircraft			
6.5	Rigging instruments and equipment			

## ADVANCED PROPULSION –GAS TURBINE ENGINE MAINTENANCE-II

	<b>L</b>	<b>T</b>	<b>P</b>
Hrs./Week	3	-	3

### DETAILED CONTENTS

Sr. No.	Theory	Time (Hrs.)	Practical	Time (Hrs.)
1.	Engine removal from The aircraft for top and complete Overhaul of engine and its associated Components crack detection checks Dimensional checks, repair and replacements.	5	Removing the engine from the aircraft, dismantling for crack detection dimensional checks repair and replacements	15
2.	Final assembly and installation of engine On test bed. Procedure for functional And operational checks	5	Sub assembly and final assembly of Engine installing the engine on test bed carrying out and the laid down checks	8
3.	Procedure for installing the engine Post installation checks	5	Ground running the engine and checking	8
4.	Engine preservation and Depreservation procedure for storage, Transportation and	2	Carrying out the engine preservation and depreservation of engine	2
5.	Ground running procedure of engine And various checks of engine performance	5	giving the ground run to engine	5
6.	Snag rectification, documentation, Certification in log Various inspection maintenance schedules, Servicing and special maintenance schedules Like propeller strikes rigging and duplicate Inspection of controls.	2	Doing the certification in log book referring various Servicing carrying out the rigging of various engine controls	
7.	Maintenance the record of oil and fuel Uplift and recording engine parameters Repair and replacements of parts and Accessories	4	Preparation of various record register of 2 Removing and installing various components and	2
8.	Engine removal and installation procedure	2		
9.	Engine starting procedure, instructions, Ground run up checks for engine performance And on condition run up of engine parameters.			
10.	Engine maintenance, minor defects Rectification, minor repair, minor replacement and Adjustments	6		
11.	Periodic inspection servicing Schedules, rigging and duplicate Inspection of control	2	Going through the various Schedules	

12.	Procedure for preservation and depreservation Of engine.	2		
13.	Documentation of certification	1		
14.	Procedure of maintenance schedules and Log books	1	Going through the various log books and schedules	2

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## MAJOR PROJECT WORK

	<b>L</b>	<b>T</b>	<b>P</b>
<b>Hrs./Week</b>	<b>3</b>	<b>-</b>	<b>5</b>

Project work is meant for solving open ended problems by applying the knowledge and skills gained through various subject areas. It is expected that the students will be sent to various industries for about 8 weeks at a stretch and they will be asked to take live problems from the industries as project work. The projects given to the student's should be such for which someone is waiting for solution. Some of the suggested project activities are given below:

- i) Projects connected with repair and maintenance of machine parts of various aircrafts.
- ii) Estimating and costing projects
- iii) Design of components/parts/jigs/fixtures.
- iv) Projects related to increasing productivity.
- v) Project work related to quality control.

Identification of industries and problems should begin will in advance (say in the beginning of vth semester.) Students should be asked to identify suitable industries and project activity. Once, teacher is expected to guide, supervise and evaluate the project work of 6 to 8 students.

## **PAPER –I**

### **AIRCRAFT RULES AND REGULATIONS**

K knowledge of aircraft Rules as far as they relate to airworthiness and safety of aircraft.

Knowledge of privileges and responsibilities of the various categories of AME Licence and approved persons.

Knowledge of “Civil Airworthiness Requirements” . “Aeronautical information Circulars (Relating to airworthiness)” “Advisory Circulars” and AME Notices issued by DGCA.

Knowledge of various mandatory documents like certificate of Registration. Certificate of Airworthiness, flight manual, export Certificate of Airworthiness.

Method of identifying approved material on aircraft.

Knowledge of various documents/Certificates issued to establish airworthiness of aircraft parts.

Various log books required to be maintained for aircraft. Method of maintaining the log book. Procedure for

making entries in logbooks: journey log book; technical log book etc.

Use of schedules, its certification, preservation.

Stores: Bonded and quarantine stores, storage of various aeronautical products including rubber goods, various fluids.

Knowledge of various terms such as certificates of flight release, Certificate of maintenance, Approved flight.

Circumstances under which C of A is suspended.

Ferry flight, MEL CDL.

Minimum equipments, Instruments required for various types of operation.

Approval of organization.

Documents required to be carried on board.

Issue of type approval.

Registration markings.

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Paper-I Aircraft Rules and Regulations

Syllabus for AME Licence Examination

**PAPER-II**  
**AIRCRAFT GENERAL ENGINEERING AND MAINTENANCE PRACTICES**

**1. AIRCRAFT MAINTENANCE PRACTICES**

General knowledge of procedure of jacking, leveling and mooring of aircraft.

Knowledge of maintenance and handling of equipments used in the maintenance of aircraft.

Knowledge of safety and fire precaution to be observed during maintenance, refueling and defueling of aircraft.

Knowledge of color coding, symbols or other markings to identify fluid systems pipelines, rubber parts and other aircraft systems of aircrafts.

Knowledge of various aircraft manuals. ATA system of classification, inspection schedules, time limit.

**2. WORKSHOP PRACTICES**

Knowledge of material, parts and use of hand tools, simple machine tools and precision measuring instruments.

Detailed knowledge of identification terminology, correct use and inspection of aircraft bolts, nut, rivets, screws and locking devices of British and American systems.

Detailed knowledge of the interpretation of engineering drawings including symbols.

Detailed knowledge of various types of gears and bearings, their use and common defects.

Knowledge of various forms of threads used in British and American system.

Knowledge of various types of threads, drills taps, reamers.

Knowledge of hardness testing machines and various types of hardness numbers.

Knowledge of various types of aircraft cables and swaging procedures used.

### **3. AIRCRAFT METALLURGY**

Knowledge of commonly used ferrous, nonferrous and composite material, their identification, properties, heat treatment processes, testing and their application in aircraft industry.

Knowledge of various type of corrosion, its cause and protection.

Detailed knowledge NDT of the hot oil and chalk, dye penetrate and fluorescent and magnetic particle technique and the subsequent inspection of the parts.

Knowledge of the X-ray, Ultrasonic and eddy current inspections.

Knowledge of arc welding, gas welding, brazing and soldering.

### **4. ELECTRICAL AND INSTRUMENT AND RADIO**

Knowledge of electrical terminology and components used in AC/DC circuitry, Ohm's law, Kirchoff's law and their application, principle of electromagnetic induction and their application. Various methods of voltage regulation.

Principle of operation of electrical test equipments.

Knowledge of principle of operation of aircraft and engine instruments.

Knowledge of various types of diodes/triodes/transistors and their function.

Knowledge of conversion from decimal to binary system and vice/versa. Symbols used in logic gates.

Elementary knowledge of computer, its applications.

Identify the bands of frequency spectrum, their use and propagation characteristics

### **5. AIRCRAFT AND ENGINE**

Knowledge of the function of the major aircraft components and types of propulsion systems used in aircraft industry.

Knowledge of the terms lift, drag, angle of attack, stall.

Knowledge of principle of four stroke cycle and braton's cycle as applied to piston engines and jet engines.

**PAPER-III**  
**CATEGORY A: AIRFRAME (AIRCRAFT HAVING AUW BELOW 5700 KG.)**

**1. AIRCRAFT MATERIALS**

Knowledge of effect of various alloying elements in steel, properties and their use.

Knowledge of heat treatment of steel and Aluminum

Knowledge of surface hardening processes used on aircraft metals.

Knowledge of welding techniques such as gas welding, arc welding, electric welding etc.

Knowledge of identification and physical characteristic of commonly used composite materials, plastics, sealants and rubbers and their inspection and repair.

Detailed knowledge of metal/fabric materials use in aircraft structure; the types of defects associated with them; inspection for deterioration and methods of rectification and reproduction; procedures for testing the soundness of these materials. Doping process.

Knowledge of various methods used for removal of corrosion from common aircraft metals and methods employed to prevent corrosion.

Knowledge of types of wood and glue and their characteristics, general defects, tests, inspection and repair.

Knowledge of cables, chains and sprockets.

**2. AERODYNAMICS**

Knowledge of the characteristics of the subsonic airflow and the various terms used therein.

Knowledge of the characteristics of the characteristics of the aerofoil's.

Knowledge of the forces acting on the aircraft during all phases of flight.

Detailed knowledge of aircraft stability and control.

Knowledge of the effect of altitude, weight, changes of engine power on performance of the aircraft.

### 3. AIRCRAFT STRUCTURES

General understanding of the various types of structures use in aircraft construction, station Nos.

Knowledge of such terms as damage tolerance, aging aircraft, SSID.

Knowledge of tail-safe and safe-life concept.

Knowledge of various types of methods used on tubular structure, semi-monocoque fuselage, method of attachment of wing to the fuselage; permanent and semi permanent joints, their inspection and repair.

### 4. AIRCRAFT SYSTEMS

General knowledge of the function, maintenance and inspection of the following:

- a) Structure and structural components constructed from metal, glass fiber, glass reinforced plastic, vinyl, Perspex.
- b) Furnishing materials, paints, surface finishes and associated materials.
- c) Elementary flying controls, hydraulic; pneumatics; landing gear; brakes; nose wheel steering; ice and rain protection; fire detection and protection; warning and extinguishing ; oxygen; air-conditioning and pressurization systems; wheels; tyres; brakes; anti-skid.
- d) Windows, doors and emergency exits.

### 5. AIRCRAFT INSTRUMENTS AND EQUIPMENTS

Detailed knowledge of the procedure of replacement and **insitu** operational tests of all instruments (except the engine related instruments) and equipment (except where the use of special test instrument /equipment if required.)

Knowledge of minor defects, their reporting, investigation and methods of rectification and repair of minor defects, rigging of aircraft, periodical inspection necessary to check the serviceability of the aircraft, preparation of a brief report with the help of sketches if necessary in case of damage to the aircraft. Symmetry check, balancing of control surfaces; duplicate inspection.

Detailed knowledge of the various inspections such as heavy landing, lightning strike, overweight landing, abnormal flight loads etc.; familiarity of the structural manuals; various types of repairs given by the manufacture their in ; incorporation of alternate/equivalent materials; raising up of modifications, repair schemes to the aircraft during overhaul.

Knowledge of terms related to aircraft weighting, preparation/precautions for weighting preparation of weight schedule, calculation of centre of gravity.

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Paper-III Cat.A: Airframe (AUW below 5700 Kg.)

SYLLABUS FOR AME LICENSE EXAMINATION

**PAPER-III**  
**CATEGORY C: PISTON ENGINES AND PROPELLERS**  
**(Uusuper charged and supercharged)**

**1. Piston Engine theory and construction**

A General knowledge of thermodynamic laws related to internal combustion engines.

Knowledge of heat engines.

A General knowledge of the Otto cycle and the relationship between volume, temperature and pressure.

A general knowledge of the terms used in the theory of piston engines and calculations of parameters from the given data.

Knowledge of various efficiencies involved in internal combustion engines.

Difference between two stroke and four stroke engines.

Knowledge of the function, construction, classification and material of the various parts and accessories of the engine including induction, exhaust, cooling systems and engine mounting.

A general understanding of the propeller terms.

A general knowledge of the purpose and functioning of all parts of a constant speed, various pitch and feathering propeller and their associated control system components.

Knowledge of the various factors effecting the engine performance.

Knowledge of the engine fire detection and protection systems.

**2. ENGINE FUEL AND OIL SYSTEM**

Knowledge of the principle of operation and constructional features of carburetors.

Knowledge of the construction features and function of components of engine fuel system.

Knowledge of types, characteristics of aviation fuel, common sources of contamination and methods to prevent such contamination. Method of checking for contamination.

Knowledge of types. Characteristics of lubricants used in piston engine oil system. Contamination of oil and its identification.

**3. IGNITION AND STARTING SYSTEM**

Knowledge of principle of operation, constructional features and functions of magnetos and ignition system components. Magneto timing procedure.

Knowledge of principle of operation, constructional features and function of various types of engine starters.

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Paper-III Cat.A: Piston Engines and propellers.

SYLLABUS FOR AME LICENSE EXAMINATION

#### **4. ENGINE INSTRUMENTS**

Knowledge of the principle of operation of the engine instruments, and detailed knowledge of replacement and in-situ operational tests thereof.

#### **5. SUPERCHARGED SYSTEM**

Knowledge of principle of operation, constructional features and function of various types of supercharged and its related components/parts.

#### **6. ENGINE MAINTENANCE**

Knowledge of trouble shooting of minor defects and methods of their rectification: rigging of engine controls; periodical inspections necessary to check the serviceability of the engine; inspection after propeller strike. Detailed knowledge of engine starting ; ground run-up adjustments and checking of the performance of the engine and its components including systems; top overhaul procedure and engine on condition maintenance.

Knowledge of NDT techniques as applicable to engine parts.

Knowledge of engine preservation and depreservation procedures.



**PUNJAB AIRCRAFT MAINTENANCE ENGINEERING COLLEGE,  
CIVIL AVIATION COMPLEX-PATIALA.**

LIST OF BOOKS RECOMMENDED FOR TOTAL SIX SEMESTERS OF AERONAUTICAL ENGINEERING AND AIRCRAFT MAINTENANCE DIPLOMA COURSE AND AIRCRAFT MAINTENANCE ENGINEER LICENCE COURSE (DGCA)

**FIRST SEMESTER**

Sr.No.	Description	Author/Publication
1.	Applied Science	i) Business Correspondence & report writing by RC Sharma & Krishan mohan.
2.	Communication Skill	ii) Group discussion published by English Book, Delhi.
3.	Engineering Drawing	iii) P.S.Gill
4.	Basic principle of Applied Mechanics	iv) Fundamental of Applied Mechanics- Birender Singh
5.	General Workshop practice-I	Shop Theory by Anderson Shop Theory by chowdhary
6.	Computer Application	i) Illustrated MS-DOS 5.0 by Russell A. Stultz. ii) Using Micro-computers –Richard W.Bright Geffery, M.Dissdate.

**SECOND SEMESTER:**

1.	Engineering Drawing	P.S.Gill
2.	Aircraft Elements	AC 12A & AC 15 A by F.A.A
3.	General Engineering	AC 9A by FAA Aircraft Electricity & Electronics-Bent Mckinley.
4.	General Workshop Practices-II	Sheet Metal Work-by FAA Workshop Theory by Chapman.
5.	Aircraft Rules & Regulation	Civil Aviation Requirements –Section-II Indian Aircraft Rules (A/c Manual) Advisory Circulars- By DGCA.

**THIRD SEMESTER:**

1.	Mechanical Engineering Drawing	Machine Drawing-P.S.Gill, N.D.Bhatt, AC Parkinson.
2.	Flight Mechanics	AC Kermode-Mechanics of flights.
3.	General Workshop Practices-III	Training Manual General Section Book-Dale Crane.

4. Aircraft Rules & Regulations-II
5. Basic & Digital Electronics
6. Power Plant Construction

CAR Section II by DGCA. Indian Aircraft Rules

- i) Basic Electronics –V.K.Mehta
- ii) Digital computers-Malvino & Leach
1. AC 12A
2. Power Plant-Bent Mchinley
3. CAIP (CAP 459) Part-II Aircraft

#### **FOURTH SEMESTER:**

1. Aircraft Material & Processes
2. Aircraft Instruments
3. Aircraft Structure
4. Power Plant System
5. Aircraft System-I
6. Maintenance Concept & Practices-I

by George Titterton-A/c. Material & Processes by Cindy foreman –Composite Material.

By EHJ Pallet & Sloley

by Bent Mckinley-A/c. maintenance & Repair

AC 15 A –by FAA, CAIP (CAP-459) Pt.II

AC 12A, Power Plant, Maint.& Repair by Bent

Mckinley CAIp (CAP-459) Pt.II Aircraft

AC-65 15A, A/c. maint. & Repair by Bent

Mckinley.

CAR Section-II, CAIP Basic.

#### **FIFTH SEMESTER**

1. Aircraft Instruments-II
2. Computer Application-II
3. Testing & Measurements
4. Aircraft Systems-II
5. Maint.Concept &Practices-II
6. Adv. Airframe Structure
7. Adv.Propustion –Gas Turbine Engine

by EHJ Pallet.

Engineering simulation-MJ Shah

Computer Oriented Numerical mehods

V.Rauraman

Mech. Measurements-B.S.Kumar

AC 15 A by FAA, CAP 459 Pt.-II

A/c. maint.& repair-Kroes & others

AC 43 1A, Non-Destructive Testing, A/c. maint.&

repair –Bent Mckinley

AC 65 A, CAIP Part-II A/c. Maint.& Repair by Bent

Mckinley

AC 12A, Power Plant, Maint.& Repair CAIP Part-II

#### **SIXTH SEMESTER**

1. Aircraft System-II
2. Maint.Concept& Practices-III
3. Industrial Engg. Practices
4. Adv. Airframe Structure-II
5. Adv. Propulsion –Gas Turbine Engine Maintenance

AC 15A, Basic Elect.& Electronics by Bent

Mckinley

EHJ Pallet & Sloley

A/c. Maint.& Repair by Kroes Watkin Light

Aircraft maintenance J.E.Haywood.

AC 12A, Power Plant , Maint. & Repair-CAIP,