

CURRICULUM FOR THREE YEAR

DIPLOMA COURSE IN

=====
: AIRCRAFT MAINTENANCE ENGINEERING :
: (HELICOPTER AND POWER PLANT) :
: Effective from Session :
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:Semester System :
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=====
UNDER DEVELOPMENT
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Prepared By

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: Curriculum Development Cell :
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:INSTITUTE OF RESEARCH,DEVELOPMENT:
:& TRAINING, U.P., KANPUR :
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APPROVED BY

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: BOARD OF TECHNICAL EDUCATION :
: U.P. LUCKNOW,on dated 04.05.2017:
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STUDY AND EVALUATION SCHEME FOR
THREE YEAR (SIX SEMESTER) DIPLOMA COURSE IN AIR CRAFT MAINTENANCE ENGINEERING(HELICOPTER & POWERPLANTS)
(To Be Effective From July 2017)

I Semester

Curriculum						Scheme of Examination									
Periods Per Week						Theory			Practical			Grand Total			
Le	Tut	Dr	Lab	Work	Tot	Examination	Sess.	Total	Examination	Sess.	Total				
c.	ori	aw		Shop	al	Dur.	Marks	Marks	Dur.	Marks	Marks	al			
4	2	-	-	-	6	1.1 Mathematics-I	2.5	50	20	70	-	-	70		
4	2	-	-	-	6	1.2 Physics-I	2.5	50	20	70	-	-	70		
6	-	-	2	-	8	1.3 General Engineering And Ground Supports	2.5	50	20	70	3	60	30	90	160
-	-	-	8	-	8	1.4 Engineering Drawing	4.0	50	20	70	-	-	-	70	
8	-	-	-	-	8	1.5 Air Law, C.A.R. & Human Factors & Limitation-I	2.5	50	20	70	-	-	-	70	
4	-	-	8	-	12	1.6 Workshop Practice	2.5	50	20	70	6	100	50	150	220
26	4	-	18	-	48	<-----TOTAL----->	--	300	120	420		160	80	240	660
												Games/NCC/Social and Cultural Activity+Community Development+ Discipline(10+20+10)	40		
												Aggregate	700		

II Semester

4	2	-	-	-	6	2.1 Mathematics-II	2.5	50	20	70	-	-	-	70	
4	2	-	-	-	6	2.2 Physics-II	2.5	50	20	70	-	-	-	70	
4	2	-	-	-	6	2.3 Mechanics	2.5	50	20	70	-	-	-	70	
7	2	-	3	-	12	2.4 Basic Electricity And Electronics Engineering	2.5	50	20	70	3	60	30	90	160
5	-	-	3	-	8	2.5 AirCRAFT Materials & Material Science	2.5	50	20	70	-	-	-	70	
10	-	-	-	-	10	2.6 Air Law, C.A.R. & Human Factors & Limitation-II	2.5	50	20	70	-	-	-	70	
34	8	-	6	-	48	<-----TOTAL----->	--	300	120	420		60	30	90	510
												Games/NCC/Social and Cultural Activity+Community Development+ Discipline(10+20+10)	40		
												Aggregate	550		

- NOTE:-
- (1) Each period will be of 50 minutes duration.
 - (2) Each session will be of 16 weeks.
 - (3) Effective teaching will be at least 14 weeks.
 - (4) Remaining periods will be utilized for revision etc.
 - (5) A good number of guest lectures by person from industries and institutions of higher education be arranged on topics such as Environmental Pollution, Safety Concerns in Industry and Entrepreneur Development for general awareness
 - (6) For Community Development Work See Annexure-I
 - (7) Objective questions in theory examinations will be of 60 question of 1/2 marks each with reasoning and other 04 questions will be of 5 marks each.

STUDY AND EVALUATION SCHEME FOR
THREE YEAR (SIX SEMESTER) DIPLOMA COURSE IN AIR CRAFT MAINTENANCE ENGINEERING(HELICOPTER & POWERPLANTS)
(To Be Effective From July 2017)

III Semester

Curriculum						Scheme of Examination										
Periods Per Week						Theory			Practical			Grand				
Lec.	Tut.	Dr.	Lab	Work Shop	Total	S U B J E C T	Examination	Sess.	Total	Examination	Sess.	Total	Tot-			
							Dur.	Marks	Marks	Marks	Dur.	Marks	Marks	Marks	al	
5	1	-	6	-	12	3.1 General Helicopter Airframe	2.5	50	20	70	3	60	30	90	160	
8	2	-	6	-	16	3.2 Helicopter Systems	2.5	50	20	70	6	100	50	150	220	
4	1	-	5	-	10	3.3 Air Craft Electricity	2.5	50	20	70	3	60	30	90	160	
7	3	-	-	-	10	3.4 Rotors	2.5	50	20	70	-	--	--	--	70	
24	7	-	17	-	48	<-----TOTAL----->	--	200	80	280	--	220	110	330	610	
						Games/NCC/Social and Cultural Activity+Community Development+ Discipline(10+20+10)									40	
															Aggregate	650

IV Semester

9	3	-	-	-	12	4.1 Theory of Flight	2.5	50	20	70	--	--	--	--	70	
6	-	-	8	-	14	4.2 Air Craft Reciprocating Engines	2.5	50	20	70	3	60	30	90	160	
6	2	-	4	-	12	4.3 Air Craft Instruments	2.5	50	20	70	3	60	30	90	160	
5	1	-	4	-	10	4.4 Air Craft Compass	2.5	50	20	70	3	60	30	90	160	
26	6	-	16	-	48	<-----TOTAL----->	--	200	80	280	--	180	90	270	550	
						Games/NCC/Social and Cultural Activity+Community Development+ Discipline(10+20+10)									40	
															Aggregate	590

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- (5) A good number of guest lectures by person from industries and institutions of higher education be arranged on topics such as Environmental Pollution, Safety Concerns in Industry and Entrepreneur Development for general awareness
- (6) For Community Development Work See Annexure-I
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(To Be Effective From July 2017)

V Semester

Curriculum						Scheme of Examination									
Periods Per Week						Theory			Practical			Grand			
Le c.	Tut al	Dr aw	Lab	Work Shop	Tot al	S U B J E C T	Theory			Practical			Tot al		
							Examination Dur.	Sess. Marks	Total Marks	Examination Dur.	Sess. Marks	Total Marks			
8	-	-	8	-	16	5.1 Air Craft Reciprocating Engines & Accessories	2.5	50	20	70	3	60	30	90	160
6	-	-	6	-	12	5.2 Avionics	2.5	50	20	70	3	60	30	90	160
3	-	-	7	-	10	5.3 Basic Computer	-	--	--	--	3	60	30	90	90
2	-	-	8	-	10	5.4 Helicopter Airframe(Chetak)	2.5	50	20	70	6	100	50	150	220
19	-	-	29	-	48	<-----TOTAL----->	--	150	60	210	--	280	140	420	630
Games/NCC/Social and Cultural Activity+Community Development+ Discipline(10+20+10)													40		
Aggregate													670		

VI Semester

4	-	-	-	-	4	6.1 Environmental Education* Disaster Management	2.5	50	--	--	-	--	--	--	--
10	-	-	10	-	20	6.2 Jet Engines	2.5	50	20	70	3	60	30	90	160
4	-	-	14	-	18	6.3 Aero Engine Helicopter	2.5	50	20	70	6	100	50	150	220
-	-	-	-	6	6	6.4 Project	-	--	--	--	-	100	50	150	150
-	-	-	-	-	-	6.5 Industrial Training	-	--	--	--	-	40	20	60	60
18	-	-	24	6	48	<-----TOTAL----->	--	100	40	140	--	300	150	450	590
Games/NCC/Social and Cultural Activity+Community Development+ Discipline(10+20+10)													40		
Aggregate													630		
30% Carry Over of I & II													375		
70% Carry Over of III & IV													868		
70% Carry Over of V & VI													1300		
Aggregate													2543		

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 - (5) A good number of guest lectures by person from industries and institutions of higher education be arranged on topics such as Environmental Pollution, Safety Concerns in Industry and Entrepreneurship Development for general awareness
 - (6) For Community Development Work See Annexure-I
 - (7) Objective questions in theory examinations will be of 60 questions of 1/2 marks each with reasoning and other 04 questions will be of 5 marks each.

MAIN FEATURES OF THE CURRICULUM

TITLE OF THE COURSE : Diploma in Air Craft Maintenance
Engineering (Helicopter &Powerplants)

DURATION : Three Years(Six Semester)

PATTERN OF THE COURSE : Semester System

INTAKE : 30

TYPE OF COURSE : Full Time Institutional

ENTRY QUALIFICATION : 10 + 2 with (Physics, Chemistry
and Mathematics) or Equivalent
and 50% aggregate in Physics,
Chemistry and Maths

MODE OF ADMISSION : Through Joint Entrance Examination Council, U.P.

III-LIST OF EXPERTS

List of Experts/Supports whose contribution helped the development of new curriculum for **Three Year Diploma Course in 'Aircraft Maintenance Engg. (Helicopter and Power Plant)'** are honorably named below – Workshop's held on Dated: 09-03-2017

Sr.No.	Name of Expert & Designation	Organisation / Address
1.	Shri. DevendraSwarup, Director	A.T.I.,Airport, Lucknow
2.	Shri. G.M.Rehnuma,Chief Lecturer	A.T.I.,Airport, Lucknow
3.	Shri. Rajesh Kumar,A.M.E	C.A.D.,Airport, Lucknow
4.	Shri. LavpreetSingh,A.M.E	C.A.D.,Airport, Lucknow
5.	ShriKanhyalalGupta,A.M.E	C.A.D.,Airport, Lucknow
6.	ShriBasant Kr. Dwivedi,A.M.E	C.A.D.,Airport, Lucknow
7.	ShriBhupendra Kr. Verma,Chief Lecturer	A.T.I.,Airport, Lucknow
8.	ShriJ.K.Saroj,Lecturer Mech. Engg.	A.T.I.,Airport, Lucknow
9.	ShriD.K.Singh,Lecturer Aero.	A.T.I.,Airport, Lucknow
10.	ShriBrijesh,LecturerMech.Engg	A.T.I.,Airport, Lucknow
11.	Km.SnehaGupta,Lecturer Aero.	A.T.I.,Airport, Lucknow
12.	Mohmd. Ahmed Siddiqui,Lecturer Elect.	A.T.I.,Airport, Lucknow
13.	ShriMukesh Singh Mehta,Lect. Avionics	A.T.I.,Airport, Lucknow
14.	ShriSantosh Kr. Singh,Lect. Avionics	A.T.I.,Airport, Lucknow
15.	ShriGauravBajpai, Instructor	A.T.I.,Airport, Lucknow
16.	Km. VandanaBhatt,Instructor Aero.	A.T.I.,Airport, Lucknow
17.	ShriM.K.Gupta, H.O.D. (Mech.Engg.)	Govt. Polytechnic, Lucknow
18.	Shri. MeenuDwivedi,Lecturer (Mech. Engg.)	Govt. Polytechnic, Lucknow
19.	Shri Sunil Kr. Yadav,Lecturer (Elect. Engg.)	Govt. Polytechnic, Kanpur
20.	Shri.M.P.SinghBhadauria, H.O.D. (Mech.Engg.) /Coordinator	I.R.D.T,U.P Kanpur
21.	Shri.L.K.Verma, H.O.D. (Electronics Engg.)	I.R.D.T,U.P Kanpur
22.	Shri.Gaurav Kishore Kannaujia,Lecturer I.T.	I.R.D.T,U.P Kanpur
23.	Shri. ArvindNath Mishra, Computer Programmer	I.R.D.T,U.P Kanpur
24.	Shri. Vivek Kumar/ShriSushil Kumar ,Draughtsman	I.R.D.T,U.P Kanpur

I Semester (Common to AME)**1.1 MATHEMATICS-I**

L	T	P
4	2	-

Rationale :

Mathematics is the back bone of engineering education. It is indispensable for understanding quantitatively the concepts of engineering and technology.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Algebra	15	8	-
2.	Trigonometry	15	8	-
3.	Differential Calculus	26	10	-
Total		56	28	-

DETAILED CONTENTS**1. ALGEBRA:**

- (i) Theory of Equation and symmetric functions of roots.
- (ii) Binomial, Logarithmic and Exponential Series, General exponential and logarithmic series (Revision).
- (iii) Complex numbers and their applications to engineering problems.
- (iv) Vectors and their graphic representation Mathematical operations of vectors.
- (v) Matrices and Determinants (Elementary Idea).

2. TRIGNOMETRY :

- (i) Inverse Circular Functions.
- (ii) De Moivre's Theorem and its application.

3. DIFFERENTIAL CALCULUS :

- (i) Method of finding derivatives of differential coefficient of a function.
- (ii) Differentiation of function of function.
- (iii) Logarithmic differentiation.
- (iv) Successive differentiation.
- (v) Partial differentiation.
- (vi) Application of findings Tangents and Normal.
- (vii) Maxima and Minima

1.2 PHYSICS-I

L T P
2 1 -

Rationale :

Knowledge and teaching of physics is a foundation course of engineering students, its purpose is to develop proper understanding of physical phenomena and the scientific concepts.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	14	7	-
2.	Topics No. 2	14	7	-
3.	Topics No. 3	14	7	-
4.	Topics No. 4	14	7	-
Total		56	28	-

DETAILED CONTENTS

1.A. THERMOMETRY :

(i) Concept of heat and temperature. Units of heat. Basic principles of measurement of temperature.

(ii) Different types of thermometers, their merits and demerits with special reference to constant volume Hydrogen Gas Thermometer, Platinum Resistance Thermometer, Thermocouple Thermometers.

(iii) Relation between Fahrenheit, Celcius, Kelvin and Rankine's, Scales of temperature.

B. CALORIMETRY :

(i) Concept of thermal capacity and specific heat, Effect of temperature on specific heat, Specific heat of solid/liquid by Bunsen's ice calorimeter.

(ii) Latents heat of fusion and vaporisation, thermal energy and heat of combustions.

(iii) Specific heat of gases, Specific heat at constant pressure and constant volume (C_p & C_v) and relationship between them. Ratio of two specific heats, specific heat of gas at low temperature, difference between vapour and gas. .

2. NATURE OF HEAT :

(i) Concept of mechanical equivalent of heat and its determination by Joule's method.

(ii) Concept of ideal and real gases. Laws governing the behaviour of gases viz. Boyle's Law, Charle's Law. Compression and expansion processes of gases - such as adiabatic, so thermal processes. Work done during these processes, Internal energy of gas.

(iii) Concept of heat transfer by conduction, convection and radiation, Coefficient of thermal conductivity and its determination by Searle's and Lee's methods. Simple numericals related to above.

3. THERMODYNAMICS :

First and second law of thermodynamics, Concept of heat engine, heat pump and refrigerator, Carnot cycle, Otto cycle and Diesel cycle and their thermal efficiencies and related numericals.

4. OPTICS :

Nature of light, Speeds of light, Law of refraction and reflection at a plane surface by Spherical Mirror and Lenses and Critical angle, Total internal reflection. Principle of Fibre optics, Optical fibre and their applications.

1.3 GENERAL ENGINEERING AND GROUND SUPPORT

L T P
6 - 2

Rationale :

The paper intends to provide acquaintance with the components common to various machines and equipments and processes generally used in aircraft.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	9	-	-
2.	Topics No. 2	9	-	-
3.	Topics No. 3	9	-	-
4.	Topics No. 4	12	-	-
5.	Topics No. 5	12	-	-
6.	Topics No. 6	12	-	-
7.	Topics No. 7	12	-	-
8.	Topics No. 8	9	-	-
Total		84	-	28

DETAILED CONTENTS

1. INTRODUCTION TO HAZARDOUS LIQUID/GASES:
Safety precautions when working with hazardous/non-hazardous gases, Oils and chemicals. Remedial action in the event of fire/accident.
2. AIRCRAFT FASTENING DEVICES:
Types, identification and symbols of- Bolts, Nuts Washers, Screws, Threads, Rivets, Pins, Keys and Key Ways.
3. PURPOSE, USE AND LUBRICATION OF BEARINGS :
Plane, split step, ball and roller bearing, Journal bearing, thrust bearing, collar bearing and special types of bearing and their application such as oil lite bearing, elastomer bear and air bearing.
4. TRASMISSION :
Different types of gear, gear trains and their use for transmission of motion, spur gear, single and double helical gear, bevel gears, worm gear, rack and penion. Concept of pitch, pitch circle and module, planetary gear system. Belt, pully chain and sprockets, lever devices, push pull rod system.
5. CABLES :

Introduction of aircraft cables, Material uses and types of cables. Cable fittings, swaging and splicing. Procedure of aircraft cables, Proof testing of aircraft cable, fair lead and turnbuckles.

6. FLUID LINES AND FITTINGS :

Rigid fluid lines, material, identification, sizes, fabrication of metal tubes.
Flexible hose, Materials of flexible hoses - low, medium and high pressure hose, identification, flexible hose inspection, testing size designation and hose fittings

7. FIRE PROTECTION :

Classification of fire, Fire extinguishers identification, inspection and operating procedure. Safety and fire precaution to be observed during fuelling and defuelling of aircraft. Fire extinguishers agents

8. NONDESTRUCTIVE TESTING :

Crack detection by various methods such as visual inspection, hot oil and chalk method. Dye penetrant method. Magnetic particle inspection, X-ray, Ultrasonic and Eddy current inspection, Fluorescent particle inspection test. NDT of composite materials. Microfilm, Microfiche and computerized presentation.

Material Testing

1. Riveting practice e.g. butt joint, lap joint.
2. Inspection of cable system.
3. Familiarization with tube and flexible hose inspection and testing.
4. Familiarization with splitting and swaging operation.
5. Bending and flaring of tube.
6. Familiarization with various kind of union used in fuel, oil and hydraulic system.
7. Familiarization with dye penetrant method.
8. Familiarization with magnetic particles inspections.
9. Familiarization with Eddy current inspections.
10. Familiarization with cable tension adjustment.

1.4 ENGINEERING DRAWING

L T P
- - 8

Rationale :

Whether it is production, design or maintenance engineer, Knowledge of engineering drawing is a must to him. From production to assembly and dismantling for maintenance knowledge of engineering drawing is essential.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	-	-	-
2.	Topics No. 2	-	-	-
3.	Topics No. 3	-	-	-
4.	Topics No. 4	-	-	-
5.	Topics No. 5	-	-	-
6.	Topics No. 6	-	-	-
7.	Topics No. 7	-	-	-
8.	Topics No. 8	-	-	-
Total		-	-	112

DETAILED CONTENTS

1. INTRODUCTION :

- 1.1 General Introduction to Engineering Drawing and its meaning.
- 1.2 Introduction of various drawing materials, instruments and equipment.
- 1.3 Use of Draughtman Instruments, Mini drafter and Set of instruments, French curves, their correct use and care.
- 1.4 Sizes of Drawings sheets and their lay out.

2A. LETTERING TECHNIQUES :

Printing of vertical and inclined, Normal single stroke capital letters and numbers.

B. INTRODUCTION TO SCALES :

Necessity and use, R.F. types used in general engineering drawing, Plane, Diagonal and Chord scales.

3. CONVENTIONAL REPRESENTATIONS :

- 3.1 Methods of showing centre lines, hidden lines, reference lines section lines and dimensional lines and dimensioning.
 - 3.2 Standard material symbols.
 - 3.3 Conventional method of representing threads, nuts, joints and welded parts.
- Exercises to illustrates the above.

4. Dimensioning Techniques.

5. PRINCIPLE OF PROJECTIONS :

Principle of projections and essential views, orthographic projection and exercises.
5.1 Plan, Elevation, Side views in first angle and third angle projections, simple exercises.

6. ISOMETRIC PROJECTION :

6.1 Isometric Scales.

6.2 Isometric Views.

7. DEVELOPMENT OF SURFACES :

7.1 Parallel line and radial line methods developments, Development of simple and truncated surfaces (Cubes, Prisms, Pyramids, Cylinders & Cones).

8. DRAWING OF TYPICAL AIRCRAFT PARTS :

Study of machine drawing and blue prints.

1.5 AIR LAW, C.A.R AND HUMAN FACTORS AND LIMITATION-I

L T P
8 - -

Rationale :

The objective and quality and related responsibility in the work of aircraft maintenance at any level requires some legislation. The paper deals with such things imperative for the knowledge of aircraft maintenance engineer and these are changeable to time to time as DGCA, New Delhi requirements

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	18	-	-
2.	Topics No. 2	18	-	-
3.	Topics No. 3	18	-	-
4.	Topics No. 4	18	-	-
5.	Topics No. 5	18	-	-
6.	Topics No. 6	10	-	-
7.	Topics No. 7	12	-	-
Total		112	-	-

DETAILED CONTENTS

1. I. A. R. :
Knowledge of Aircraft manuals, Aircraft Rules. Air worthiness advisory circular, Aeronautical information circulars.
2. COCKPIT CHECK LIST, MEL, CDL AND DEFECTS :
Minimum equipment list, preparation and use of concept and emergency check list. Defect recording, reporting, investigation, rectification and analysis. Maintenance control by reliability method.
3. AIRCRAFT MAINTENANCE PROGRAMMES AND THEIR APPROVAL:
Reliability programme, AMP, On condition maintenance, TBO-revision programme, Maintenance of fuel and oil consumption records, Fixing routine maintenance periods and component TBO's initial and revision.
4. APPROVAL OF ORGANISATIONS
Approval of organisation in CAR 145, CAR-M, Approval of organisation in Cat.E and Cat.G.
5. AIRWORTHINESS AND CONTINUED AIRWORTHINESS :
Registration of aircraft, certificate of airworthiness, Rebuilding of aircraft, Special flight permits, Airworthiness of ageing aircraft, Inspection of wooden aircraft, Airworthiness requirement for gliders, Microlight aircraft and hot air balloons. Flight manuals, pooling of aircraft, construction certification and operation of experimental/amateur built aircraft, Age of aircraft, Import/Export of aircraft, Space, Item of equipments, Load and trim sheet.

6. FUELING, REFUELLING AND CALIBRATION OF FUELS :
Requirments for fueling, refueling, calibration of fuel, storage, handling quality control and unusable fuel.

7. HUMAN PERFORMANCE :

7.1 General : The Need to take human factors into account incident attributable to human factors/human error; Murphy's law.

7.2 Human Performance and Limitations : Vision, Hearing, Information Processing, Attention and perception, Memory, Claustrophobia and physical access.

7.3 Social Psychology : Responsibility- Individual and group, Motivation and de-motivation, Peer pressure, Culature issues, Team working, Management, supervision and leadership.

7.4 Factors Affecting Performance : Fitness, Health, Stress - Domestic and work related, Time pressure and deadlines, Workload - Overload and underload, Sleep and fatigue, Shift work, Alcohol, medication, srug abuse.

1.6 WORKSHOP PRACTICES

L T P
4 - 8

Preamble :

There are basically 4 shops to workshop practice i.e. Carpentry shop, Fitting shop, Machine shop and Welding shop. The purpose is to familiarization of various machines used in aircraft repair and maintenance.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	6	-	-
2.	Topics No. 2	6	-	-
3.	Topics No. 3	6	-	-
4.	Topics No. 4	6	-	-
5.	Topics No. 5	6	-	-
6.	Topics No. 6	13	-	-
7.	Topics No. 7	13	-	-
Total		56	-	112

DETAILED CONTENTS

1. Safety rules and Precautions in workshop- Instructions in the remedial action to be taken in the event of accidents/ human or machines

2. GENERAL WORKSHOP TOOLS :

A. Marking and Measuring tools - Steel scale, Surface gauge, Protector, Try square, Scriber, Different types of Punches, Divider, Calipers, surface Plate, Gauges, Vernier Callipers, Micrometer, Combination set, Marking gauges, Bevel square.

B. Cutting Tools - Different types of File, Hacksaw, Chisels Tap and Die, Different types of Drill, Reamer, Different types of saw, Different types of Plainer, Different types of Power tools- lathe, Grinding Machine, Power Hacksaw, Milling Machine, Drilling Machine

C. Holding and Supporting Tools - Different types of vice, Bench hook, Bar clamp, Tongs, Pliers, Jigs and fixtures.

D. Striking Tools - Different types of Hammer.

E. Miscellaneous Tools - Screw Driver, Pincer, Different types of wrench, Keys, File Card, Spanner & drift.

3. Handling and uses of different type of precision measuring tools.

4. Limits fits and allowances. Concept of interchangeability.

5. Working knowledge of Tools used on the following machine tools - Power Hacksaw, Drilling Machine, Lathe (Centre Capston and Turret). Grinding Machines

6. Welding

- A. Safety precautions observed before and during welding.
- B. Different types of welding - Gas welding, Electric arc welding, Seam welding, Spot welding, TIG & MIG, Types of fluxes and its advantages.
 - (a) Gas welding - Types of gas welding, identification of cylinders pressure regulator (single and double), welding torch and equipment, type of flame and blow pipe.
 - (b) Electric Arc Welding - Types of arc welding - metallic arc, gas shield arc welding (TIG & MIG), plasma arc welding.
 - (c) Pressure Welding - Seam, Butt and spot welding.
 - (e) Types of welded joints and defect analysis
- 7. Brazing - Al brazing, Cu brazing, Silver brazing and Stainless steel brazing.

WORKSHOP PRACTICALS

GENERAL

1. Safety precautions to be observed in workshop
2. Familiarization with various tools and equipments in use in the workshop.
3. Workshop, Work materials and Tool materials.

EXERCISE :

FITTING SHOP :

1. Hacksawing procedure, Precautions and Techniques in Hacksawing, Different number of Teeth in Blade, Utility.
2. (a) Making a straight cut with Hacksaw.
(b) Cutting a Solid block.
(c) Cutting a Channel.
(d) Cutting a corner
(e) Cutting a Conduit.
3. Cutting a square piece of 2" sides with Hacksaw.
4. Practice in the use of different files, precautions in the use of different filing technique and methods.
5. Exercise 3 to be filed approximate size to side 2".
6. Filing the above exercise top surface to flat.
7. Filing the sides of above job to make right angle.
8. Making of "T" fitting.
9. Making Male and Female as per diagram given.
10. Making circular hole by drilling and finishing with file.
11. Making a square hole in a sheet.
12. Making a Diagonal fitting.
13. Practice in riveting and making a riveted joints.

MACHINE SHOP :

1. Familiarization with the Machines in the Machine shop with -
 - (a) Lathe
 - (b) Drilling Machine.
 - (c) Sharpening of Tool Bits.

EXERCISE :

1. Practice of Plain Turning, Facing of a M. S. Rod.
2. Step turning of Rod.
3. Thread Cutting External
4. Taper turning.
5. Internal Turning Procedure.
6. Cutting Threads Internally by tape.
7. Knurling Practice.

AECR CARPENTRY :

1. Familiarisation with Tools and Equipments and Safety procedure in Carpentry.
2. Measuring and Making tools.
3. Cutting Tools, Saw, Planes, Chisels etc.,
4. Drilling and Boring Tools : Carpenters Brace Augarbit, Rosebit, Rosebit and Bradwal.

EXERCISE :

1. Procedure of use Saws and setting of the teeth.
2. Practice in Sharpening of Saws Teeth.
3. Practice in use of different types of chisels and shrpeneing
4. Practice in Grinding and Sharpening of various types of Chisels.
5. Practice of plaining.
6. Procedure of marking different types of cut.

7. Making a Half Lap joints and 'T' joints and Sawing practices as per drawing.

WELDING SHOP :

Familiarisation with Tools, equipments used in the welding shop and precautions.

1. Oxygen and Acetyline Cylinders.
2. Acetyline regulator for Low Pressure.
3. Gas Cutting Equipment and Welding tips.
4. Pressure Regulators, Hose and Hose fitting, Welding Torch, Goggles, Spark, Filler Rod Wire Brush, welding table with fire, Brick to.

EXERCISE :

1. Practice of lighting the Gases.
2. Oxidising, Neutral and Reducing Flames.
3. Practice in making Head welding.
4. Practice a Line Brazing.
5. Practicing a Seam Soldering
6. Practicing a Butt Welding.

Rationale :

Mathematics is the back bone of engineering education. It is indispensable for understanding quantitatively the concepts of engineering and technology.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Integral Calculus	28	14	-
2.	Co-Ordinate Geometry	28	14	-
Total		56	28	-

DETAILED CONTENTS

1. INTEGRAL CALCULUS:

- (i) Methods of indefinite integration.
- (ii) Integration by Substitution.
- (iii) Integration by parts.
- (iv) Application of integration in calculation of Surface, Area and Volumes of cylinder, Cone and Sphere.

2. CO-ORDINATE GEOMETRY :

- (i) Cartesian and Polar co-ordinates and their relationship through the system of representation of point in space and in a plane. Inter-relationship between Polar and Cartesian co-ordinates. Polar and Cartesian equation of standard curves.
- (ii) Straight lines, Planes and Sphere in space, distance between two points of space. Findings equations of a straight line and shortest distance between two lines.
- (iii) Standard form of curves of parabola, hyperbola, ellipse and tangents and normals.
- (iv) Study of general equations of Second Degree for representing of various curve such as a pair of straight line, circle, parabola and ellipse.

2.2 PHYSICS-II

L T P
2 1 -

Rationale :

Knowledge and teaching of physics is a foundation course of engineering students, its purpose is to develop proper understanding of physical phenomena and the scientific concepts.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	14	7	-
2.	Topics No. 2	14	7	-
3.	Topics No. 3	14	7	-
4.	Topics No. 4	14	7	-
Total		56	28	-

DETAILED CONTENTS

1. WAVE MOTION AND SOUND :

Mechanical waves, Sinusoidal wave, Interference phenomena and Standing waves. Speed of sound, Production of sounds, Intensity of sound waves, Pitch and quality. Doplar's effects and Ultrasound waves.

2. KINEMATICS :

- (i) Angular velocity, Angular acceleration, Angular momentum.
- (ii) Relation between Angular and linear velocity.
- (iii) Centrifugal force.
- (iv) Motion in a vertical circle.
- (v) K.E. of rotation.
- (vi) Simple theory of vibrations and harmonic resonances
- (vii) Numerical based on above topics.

3. PROJECTILE :

Parabolic motions, Projectile thrown horizontally and at an angle, Problems on time of flight, horizontal range and maximum horizontal range.

4. MOTION OF SATELLITES - ESCAPE VELOCITY :

- (i) Orbital speed of satellite.
- (ii) Period of revolution of satellite.
- (iii) Artificial satellite.
- (iv) Weightlessness in satellite.
- (v) Binding energy of satellite.
- (vi) Max height attained and velocity of satellite.
- (vii) Geo-stationary satellites

(viii) Jet propulsion theory.

2.3 MECHANICS

L T P
4 2 -

Rationale :

This subject deals with fundamental concepts of mechanics which are useful for the AME students for further understanding the second and final year subject/topic like engine, braking system and in general.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	6	3	-
2.	Topics No. 2	6	3	-
3.	Topics No. 3	6	3	-
4.	Topics No. 4	6	3	-
5.	Topics No. 5	6	3	-
6.	Topics No. 6	6	3	-
7.	Topics No. 7	6	3	-
8.	Topics No. 8	6	3	-
9.	Topics No. 9	6	3	-
10.	Topics No. 10	2	1	-
Total		56	28	-

DETAILED CONTENTS

1. VECTORS AND FORCE ANALYSIS :

Concept of Scalars and Vectors quantities, Graphical representation of vectors, Composition and Resolution of force vectors, Law of Parallelogram of forces and Law of Triangle of forces. Lami's theorem, Conditions for equilibrium of a particle under the action of number of forces, Concept of moment of a force, Resultant of forces and their equilibrant. Condition of equilibrium of a rigid body acted upon by number of forces. Related numericals, Concept of free body diagram.

2. FRICTION :

Static and dynamic friction, Limiting friction. Laws of friction, Angle of friction. Coefficient of friction. Numerical problems.
Application of friction in Aircraft/Aviation and its effect in terms of wear, tear and life.

3. WORK, POWER AND ENERGY :

Torque and force, Work done by a force and torque. Kinetic and potential energies. H.P. of an engine and its efficiency. Motion in a straight line subjected to a force.

4. SIMPLE MACHINES :

Introduction, types of pulleys. Mechanical advantage and velocity ratios, Simple wheel and axle, Weston's differential pulley block and their use. Screw Jacks. Numerical problems.

5. MOMENT OF INERTIA :

Moment of inertia of plane areas, Radius of gyration, General theorems on moment of inertia

(i) Theorem of parallel axis.

(ii) Theorem of perpendicular axis.

6. MECHANISMS:

Definition of link, Frame and mechanism, Difference between machine and mechanism, Kinematic pairs, Lower and higher pairs. Introduction to four bar mechanisms, Slider crank mechanism, Introduction to cams and its use.

7. STRENGTH OF MATERIALS :

Stress, Strain and Elasticity, Tensile and compressive stress, Hooke's law, different types of elasticity, Poisson ratio, Relation between moduli. Determination of Young's modulus, for a material, numericals.

8. BEAMS AND TRUSSES :

Definitions of the terms. Concept of tie and struts, Types of supports. Calculation of reaction and supports of beams trusses and cantilevers. Concept of shear force and bending moment at a section of a beam under various kinds of load. Shear force and bending moment diagram.

9. FLUID MECHANICS:

Introduction to fluid mechanics, viscosity, Surface Tension, Importance of their knowledge in engineering field, Various kinds of fluid flows (Open and closed channels) Laminar and turbulent flows, Bernoulli's equation and its application in general and in aeronautics. Introduction to Reynolds numbers.

10. Application of mechanics in Aeronautics (Brief Idea).

2.4 BASIC ELECTRICITY & ELECTRONICS

L T P
7 2 3

Rationale

An A.M.E. diploma holder is involved in various jobs ranging from preventive maintenance of aircraft to fault location in circuits, commission of new component, selection of suitable component for improvement. In order to carry out these and similar jobs effectively on any equipment circuitry or machinery, specialised knowledge of concerned field is essential.

However, for acquiring knowledge in any specialised field of electrical engineering, a group of certain common fundamental concepts, principles and laws involved and mastering of some manual skills are the pre-requisites to be covered in the subject of basic electricity.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.N.	Units	Coverage Time		
		L	T	P
1.	Basic terminology and their concept	5	1	-
2.	D.C. circuits	12	4	-
3.	Introduction To Semiconductor Devices	15	4	-
4.	Capacitors	12	4	-
5.	Electromagnetism	12	3	-
6.	Electromagnetic induction	15	4	-
7.	A.C. circuits	15	4	-
8.	Polyphase circuits	12	4	-
TOATL		98	28	42

DETAILED CONTENTS

1. Basic Terminology and their concepts
 - 1.1 Current, EMF, potential difference (Voltage), resistance, resistivity, their units, conductors & insulators.
 - 1.2 Effect of temperature on the resistance of conductors, semiconductors (C, Si, Ge) and insulators physical explanation, temperature coefficient resistacne.
 - 1.3 Electrical power, energy and their units (SI).
 - 1.4 Relationship between electrical, mechanical and thermal SI units of work, power and energy.
2. D.C. Circuits
 - 2.1 Kirchoff's laws.
 - 2.2 Simple numerical problems based on Kirchoff's laws.
 - 2.3 Introduction to Thevenin and Superposition theorem.
 - 2.4 Operation of photo cells, Construction, Material and operation of thermo-couples.
3. Introduction To Semiconductor Devices

Introduction of semiconductor and their application in aviation. Types of semiconductor. Band theory of solids.

4. Capacitors

4.1 Concept of capacitor, capacity of parallel plate capacitor, and effect of physical parameters.

4.1 Energy stored in a capacitor, dielectric and its influence on capacitance of a capacitor, dielectric constant dielectric breakdown and dielectric strength. Dielectric loss.

4.3 Series and parallel combination of capacitors.

4.4 Variable capacitors.

4.5 Charging and discharging of capacitors.

4.6 Simple problems on capacitors.

5. Electromagnetism

5.1 Theory of magnetism, Magnetic material, Magnetism and demagnetism, Electro magnetic waves.

5.2 Concept of magnetic flux, flux density, magnetic field intensity, permeability and their units.

5.3 Magnetic circuits, concept of reluctance and mmf and simple problems.

5.4 Analogy between electric and magnetic circuits.

5.5 B-H curve and magnetic hysteresis (No mathematical derivation).

5.6 Elementary ideas about hysteresis loss.

6. Electromagnetic Induction

6.1 Faraday's laws of electromagnetic induction. Lenz's law, simple problem. Dynamically induced emf.

6.2 Self induced emf, inductance, its role in electrical circuits. Simple problems.

6.3 Mutually induced emf, mutual inductance, its role in electrical circuits. Simple problems.

6.4 Energy stored in magnetic circuit.

6.5 Rise and decay of current in inductors.

6.6 Force on a current carrying conductor placed in a magnetic field and its applications.

6.7 Elementary idea about eddy current loss.

7. A.C. Circuits

7.1 Recapitulation of terminology, instantaneous value, maximum (peak) value, cycle, frequency, alternate current and voltage. Difference between AC and DC, Static electricity and conduction.

7.2 Equation of an alternating voltage and current and wave shape varying sinusoidally.

7.3 Average and RMS value of alternating voltage and current. Importance of RMS value. Simple problems.

7.4 Concept of phase, phase difference and phasor representation of alternating voltage and current.

7.5. A.C. through pure resistance, inductance, capacitance, phasor diagram and power absorbed.

7.6 R-L series circuit, idea of impedance and calculations.

7.7 Apparent power, reactive power and active power, power factor, its importance and simple problems.

7.8 R-C series circuit , simple problems.

7.9 R-L-C series circuit , simple problems.

7.10 Solution of simple parallel A-C circuits by

(a) Phasor diagram method,

(b) Admittance method.

7.11 Solution of AC circuits series/ parallel by j method. (simple problems).

7.12 Resonance (Series and parallel) and practical application, simple problems.

8. Polyphase System

8.1 Introduction to polyphase system. Advantage of three phase system over single phase system.

8.2 Star and Delta connections. Relationship between phase and line value of currents and voltage. Power in polyphase circuits. Simple problems of balanced circuits only.

BASIC ELECTRICITY & ELECTRONICS LAB

i) To show the variation of resistance of a lamp with temperature by plotting a V-I curve for 100W filament lamps.

ii) To study the colour coded resistance and to verify the same by multimeter.

iii) To measure the total or equivalent resistance of colour coded resistors connected in series and parallel and to verify the same by multimeter.

iv) To verify the Ohm's laws.

v) To measure the total or equivalent capacitance of capacitors connected in series and parallel and to verify the same by multimeter.

vi) To find the relationship between voltage and current for R-L series circuit for variable resistances & variable inductance.

vii) To measure the power factor in a single phase AC circuit by using voltmeter, ammeter & wattmeter.

viii) To study the B-H curve for a ferro-magnetic core.

IX) To study the phenomenon of electro magnetic induction.

x) Verification of voltage and current relations in Star and delta connected systems.

xi) Testing of diodes and transistors.

xii) Soldering Practices.

2.5 AIRCRAFT MATERIALS AND MATERIAL SCIENCE

L T P
5 - 3

Preamble:

The aim of Aircraft Maintenance Engineering is to familiarise with the material of various parts of Aircraft and to make best use of material available in single form or in combination. For this purpose knowledge of Material Science is essential.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	8	-	-
2.	Topics No. 2	6	-	-
3.	Topics No. 3	8	-	-
4.	Topics No. 4	6	-	-
5.	Topics No. 5	6	-	-
6.	Topics No. 6	6	-	-
7.	Topics No. 7	8	-	-
8.	Topics No. 8	8	-	-
9.	Topics No. 9	8	-	-
10.	Topics No. 10	6	-	-
Total		70	-	42

DETAILED CONTENTS

1. INTRODUCTION TO AIRCRAFT MATERIALS (Non Metals) :
 - A. Air craft woods and their uses, their structure, strength of wood, Types of glues
 - B. Introduction to Plywood, its construction and use.
 - C. Types of aircraft Fabric, their specifications and testing.
 - D. Reinforcing tapes, threads and their specification and requirement.
 - E. Introduction to ropes and thinner, classification and types, Tauetening and non tauetenin dopes.
2. Rubber- Natural synthetic rubber, Types of synthetic rubber, Buna-s Buna-N, Neopren Butyl and thickol and their uses and storage and service life.
3. Introduction to plastic - Classification, inspection, thermo plastic and thermo setting plastic.
4. Aircraft adhesives and seallent used and storage
5. INTRODUCTION TO FERROUS MATERIALS :

A. Physical terms like- hardness, brittleness, malleability Ductility, elasticity, density, fusibility, conductivity, contraction and expansion.

B. Heat treatment Terms - Critical range, Annealing, Normalizing, Heat treatment, Hardening Quenching, Tempering carburizing, case hardening

C. Physical Test Terms - Strain, stress, tensile strength, elastic limit, proportional limit, proof stress, yield strength, yield point elongation, reduction of area, modulus of elasticity.

D. Hardness testing- Rockwell, Brinell and universal testing machine.

6. STEEL AND ITS ALLOY :

A. Plain carbon steel, effect of individual elements. SAE numbering system, Air craft steel and corrosion resistant steel.

B. Heat treatment of steel- Critical range, structure of steel, theory of heat treatment.

C. Introduction to various methods of heat treatment. Hardening, Tempering, Annealing, Normalising, Carburising, Case hardening and their Different processes. Heat treatment of carbon steels, Critical points in iron-carbon diagram. Refining process and their temperature. Temperature colour guide.

7. INTRODUCTION TO NON FERROUS METALS :

A. Introduction to Ni and its alloy, Cu and its alloy- Properties and types. Identification of those materials in various heat treated states and forms.

B. Introduction to Air Craft Aluminium alloys, Nomenclature, classification, heat treatment of Al alloy.

C. Mg and its alloys, Ti and its alloys, Inconel Monel and their uses

8. SHAPING OF METALS :

Forging, Drawing, Casting, Rolling, Bending, Extruding, Shearing, Forming and Piercing.

9. COMPOSITE MATERIAL :

A. Composite, advantages & uses of composite material.

B. Reinforcing fibres, type & uses.

C. Terms : warp, weft, unidirectional, bidirectional, mats fabric weaves, satin weaves, hybrids, intraply hybrid, interply hybrid.

D. Matrix material, thermosets, thermoplastic, epoxy resin, working with resin & catalysts, adhesive pre-impregnated materials, fillers, metal matrix composites.

E. Core material, honey-comb, foams-styrofoam, urethane, PVC, strux.

F. Different types of manufacturing techniques, manufacturing methods, compression, moulding, vacuum bagging, filament winding, wet lay-up, lightning protection & painting of composite part.

G. Safety precautions in the use of composite material.

H. Curing method of composite material in brief- autoclave, heating blankets.

I. Machinery of cured composite.

J. Detection of defects/deterioration in composite

10. CORROSION AND ITS PREVENTION :

Corrosion and their type, Detection of corrosion, prevention of corrosion, method of preventing corrosion, special coating, chemical films, special paints like Abrasive Resistant Paint, Heat and corrosive resistive paints and electroplating.

Rationale :

The objective and quality and related responsibility in the work of aircraft maintenance at any level requires some legislation. The paper deals with such things imperative for the knowledge of aircraft maintenance engineer and these are changable to time to time as DGCA, New Delhi requirements

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	20	-	-
2.	Topics No. 2	20	-	-
3.	Topics No. 3	20	-	-
4.	Topics No. 4	20	-	-
5.	Topics No. 5	20	-	-
6.	Topics No. 6	40	-	-
Total		140	-	-

DETAILED CONTENTS

- AIRCRAFT INSTRUMENTS, EQUIPMENTS AND ACCESSORIES :**
Overhaul and periodical inspection of aircraft instrument, maintenance of test equipment, Airworthiness procedure for aircraft system/ accessories shop, FDR, CVR, GPWS, ACAS.
- LICENSING OF AIRCRAFT MAINTENACE ENGINEERS (CAR-66):**
Issue of AME licenses, its classification and experiments requirements, procedure of examination for issue/extension of BASIC and AME licenses. Classification and certification responsibilities of AME licence for Helicopters, Endorsement, renewal and certification privileges of AME licence, Grant of open AME licence. Issue of BAMEC and authorisation to AME/Approved person. Grant of approval to persons engaged in overhaul, Major repairs of component/aircraft engine. Approval of FEE, CFE, GET. Student flight engineer/Flight Engineers licence. Validation of foreign AME licence, Mandatory modification and inspection.
- OPERATIONAL REQUIREMENTS OF AIRCRAFT :**
Operation of commercial Air Transport Aeroplanes. General aviation Aeorplanes, Commercial air transport and general aviation Helicopters. Powered hang gliders, Exit low seating. Airworthiness, maintenance and operational requirements for extended range operation with twin engine aeroplane for commercial air transport operation. Requirements for operation manual; Implementation of RVSM, Performance based navigation. Requirements for evaluation, certification and maintenance of aircraft flight simulators and synthetic flight training device. Airworthiness requirements for CAT II and CAT III A operation.
- Airborne communication, navigation, radar and flight testing of aircraft.

5. MISCELLANEOUS REQUIREMENTS :

I. Weight and balance control, storage of aircraft parts, Concessions, Aircraft log books, provision of medical supplies in aircraft. Document to be carried on board by Indian registered aircraft and procedure of issue of taxi permit.

II. CAR-21,

6. HUMAN PERFORMANCE :

6.1 Physical Environment : Noise and fumes, Illumination, Climate and temperature, Motion and vibration, Working environment.

6.2 Tasks : Physical work, Repetitive tasks, Visual inspection, Compels system.

6.3 Communication : Within and between teams, Work logging and recording, Keeping up to date, currency, Dissemination of information.

6.4 Human Error : Error models and theories, Types of error in maintenance tasks, Implications of errors (i.e. accidents), Avoiding and managing errors.

6.5 Hazards in the Workplace : Recognizing and avoiding hazards, Dealing with emergencies.

III Semester**3.1 GENERAL HELICOPTER AIRFRAME**

L	T	P
5	1	6

Rationale:

This paper equips the maintenance engineer with the pre and post requisites of flight to facilitate him in his work to meet the desired objectives.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1 & 2	12	2	-
2.	Topics No. 3 & 4	12	2	-
3.	Topics No. 5 & 6	12	2	-
4.	Topics No. 7 & 8	12	2	-
5.	Topics No. 9 & 10	12	2	-
6.	Topics No. 11 & 12	10	2	-
7.	Topic No. 13	10	2	-
Total		80	14	94

DETAILED CONTENTS

1. Airworthiness requirements for structural strength.
2. Structural classification, primary, secondary, and tertiary.
3. Failsafe, Safe life, damage tolerance concepts.
4. Zonal and station identification system.
5. Stress, Strain, Bending, Compression, Shear, Torsion, Tension, Hoop stress, Fatigue.
6. Drains and ventilation provisions.
7. System installation provisions.
8. Lightning Strike protection provisions.
9. Fuel Storage.
10. Structural assembly techniques: riveting, bolting, bonding: methods of surface protection, such as chromating, anodizing, painting, surface cleaning.
11. Airframe Symmetry: methods of alignment and symmetry checks.

12. Construction methods: Stressed skin fuselage , formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning and anti-corrosive protection, pylon, stabilizer and under carriage attachments, seat installation.

13. Equipment and furnishings: Emergency equipment requirements, seats, harness and belts, lifting systems, emergency flotation system, cabin lay-out, cargo retention, equipment lay-out, cabin furnishing installation.

Doors: Construction, mechanisms, operation and safety devices

Windows and windscreen construction

Firewalls

Engine mounts

General Helicopter Airframe Practical

1. Ground handling of helicopter
2. Pre-flight inspection of helicopter
3. Starting and running of engines
4. Observation of instrument readings, function check(s) of electrical components, Stopping of engines
5. Use of ground equipment for moving, lifting or servicing aircraft Installation and testing of equipment, Removal, replacement, in situ inspection, and function testing -Errors and electrical faults of electrical equipment.
6. Removal of control surfaces, landing gear, main rotor blades, stabilizer, tail rotor blades, fin and seats
7. Inspection: inspection of condition of fuselage, alignment checks, free from distortion and symmetry
8. Checking of main rotor blade and other airframe components for condition and free from distortion
9. installation of main and tail rotor blades, empennage, control surfaces, and engine check rigging angles of wings and tail plane
10. Adjust flying controls and check control surface movements
11. Replace landing gear and check alignment track
12. Wheel and brake - removal, inspection, installation and function check
Tire inspection, identification of defects Brake units: inspection
13. Familiarisation and inspection of rotor and fuselage construction, including primary and secondary structures
14. Forged, extruded, cast and sheet materials used
15. Main joints: methods of riveting, spot welding, and adhesive bonding
16. Doors and cut-outs, positions of inspection panels, removal of fairings and methods of gaining access to all parts of structure
17. Flight Control Systems: examination of control system; checking of Control surface movements and cable tensions; interconnections of autopilot to control systems examination of power-operated control systems Control surfaces
18. Inspection - metal-skinned ailerons, elevators and/or rotor blades.
19. Hinges and actuating mechanisms: inspection

20. Correction of mass balance after repair of controls surfaces/rotor blades.

21. Simulated airline check

22. Familiarization with maintenance schedule Performance of sample periodic inspection by the students, including signing of check sheets for each job done and recording of and, if possible, rectification of all defects.

23. Weighing of the aircraft and calculation of centre of gravity.

3.2 HELICOPTER SYSTEMS

L T P
8 2 6

Rationale:

Various pneumatic hydraulic and mechanical systems used for smooth operation of aircraft to need proper maintenance. So their knowledge is essential.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	15	3	-
2.	Topics No. 2	15	3	-
3.	Topics No. 3	15	3	-
4.	Topics No. 4	10	4	-
5.	Topics No. 5	15	4	-
6.	Topics No. 6	15	4	-
7.	Topics No. 7	15	4	-
8.	Topics No. 8	15	4	-
9.	Topics No. 9	15	3	-
Total		130	32	94

DETAILED CONTENTS

Hydraulic Power (ATA 29)

System lay-out
Hydraulic fluids
Hydraulic reservoirs and accumulators
Pressure generation: electric, mechanical, pneumatic
Emergency pressure generation
Pressure Control
Power distribution
Indication and warning systems
Interface with other systems

Pneumatic/Vacuum (ATA 36)

System lay-out
Sources: engine, compressors, reservoirs, ground supply
Pressure control
Distribution
Indications and warnings
Interfaces with other systems

Landing Gear (ATA 32)

Construction, shock absorbing
Extension and retraction systems: normal and emergency
Indications and warning

Wheels, tyres, brakes
Steering
Skids, floats

Ice and Rain Protection (ATA 30)

Ice formation, classification and detection
Anti-icing and de-icing systems: electrical, hot air and chemical
Rain repellent and removal
Probe and drain heating, wiper system

Air Conditioning

Sources of air supply including engine bleed and ground cart
Air conditioning systems
Distribution systems
Flow and temperature control systems
Protection and warning devices

Fuel Systems (ATA 28)

System lay-out
Fuel tanks
Supply systems
Dumping, venting and draining
Cross-feed and transfer
Indications and warnings
Refuelling and defueling

Fire Protection (ATA 26)

Fire and smoke detection and warning systems
Fire extinguishing systems
System tests

Lights (ATA 33)

External: navigation, landing, taxiing, ice
Internal: cabin, cockpit, cargo, emergency

Specification of 100 Air transport association (ATA) of America, Aeronautical and other applicable standard including ISO, AN, MS, NAS and MIC

HELICOPTER SYSTEM PRACTICAL

Hydraulic systems

Familiarize with Hydraulic fluids & system component and lay-out and perform servicing, minor maintenance and functional check of Hydraulic reservoirs and accumulators
Hydraulic pressure generation: electric, mechanical, pneumatic Emergency hydraulic pressure generation, Hydraulic pressure Control, Hydraulic power distribution Indication and warning systems, Interface with other systems

Pneumatic systems

Familiarize with 'Pneumatic / vacuum Systems' components and functioning of Sources: engine / *APU Pressure control Distribution Indications and warnings Interfaces with other systems

Landing Gear (ATA 32)

Functional checks after replacement of representative cross-section of systems Components, including ground testing of hydraulic system with retraction of landing gear and function testing of electrical system; ground running of engines

Air supply

Familiarize with sources of air supply including engine bleed, *APU and Ground cart

Air Conditioning

Familiarize with the 'Air Conditioning System' components, layout (Air cycle and vapor cycle machines, Distribution systems; Flow, temperature and humidity control system) and demonstrate system functional check

Pressurization

Familiarize with 'Pressurization System' components and layout (Control and indication including control and safety valves; Cabin pressure controllers)

Safety and warning devices

Familiarize with the components pressurization system protection and warning devices and system layout.

Fire Control systems

Familiarize with the component, system layout and demonstrate functional check of fire and *smoke detection, warning systems; fire extinguishing systems and system tests.

De-icing systems

Familiarize with components, system and control of de-icing systems, electrical, hot air, pneumatic and chemical

3.3 AIRCRAFT ELECTRICITY (Common to AME)

L T P
4 1 5

Rationale:

Use of electrical systems in the design of aircraft is well known to everyone. Maintenance of these systems is a matter of utmost importance. The purpose is to develop proper understanding of various aspects of phenomenon in the aircraft.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	5	1	-
2.	Topics No. 2	5	1	-
3.	Topics No. 3	5	1	-
4.	Topics No. 4	5	1	-
5.	Topics No. 5	5	1	-
6.	Topics No. 6	5	1	-
7.	Topics No. 7	5	1	-
8.	Topics No. 8	5	1	-
9.	Topics No. 9	5	1	-
10.	Topics No. 10	5	2	-
11.	Topics No. 11	5	1	-
12.	Topics No. 12	5	1	-
13.	Topics No. 13	5	1	-
Total		65	14	80

DETAILED CONTENTS

DC Sources of Electricity

- . Construction and basic chemical action of: primary cells,
- . secondary cells, lead acid cells, nickel cadmium cells, other alkaline cells;
- . Cells connected in series and parallel
- . Internal resistance and its effect on a battery
- . Construction, materials and operation of thermocouples
- . Operation of photo-cells
- . Battery installation and operation, Emergency power generation
- . External/ground power

General description of electrical measuring instruments

- . Requirement of indicating instruments.
- . Construction & working of moving coil type, moving iron type and Dynamometer type instruments.
- . Ammeter, voltmeter, Ohm meter, watt meter, frequency meter, megger, conversion of ammeter to voltmeter and vice versa.
- . Knowledge of various AC and DC measuring instruments
- . Application of multiplier and shunt.

Electrical Cables and Connectors

- Continuity, insulation and bonding techniques and testing
 - Use of crimp tools: hand and hydraulic operated
 - Crimping, Testing of crimp joints
 - connectors types, pins, plugs, sockets, insulators, Connector pin removal and Insertion and current and voltage rating, coupling, identification codes
 - high tension and Co-axial cables: testing and installation precautions
-
- Wiring protection techniques: cable types, construction and characteristics Cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding.

Electronic Displays

Principles of operation of common types of displays used in modern aircraft, including Cathode Ray Tubes, Light Emitting Diodes and Liquid Crystal Display

Data Buses

Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications.

Voltage regulation

voltage regulator, vibrating type, carbon pile type, three unit control panel, paralleling of generator, repair and maintenance, circuit protection

D.C. Generator · Basic Generator theory

- construction and purpose of components in DC generator
- Operation of, and factors affecting output power, torque, speed and direction of rotation of DC Generator
- Series wound, shunt wound and compound Generator
- Characteristics of generator, armature reaction, methods to overcome it
- starter generator construction, DC power generation

DC Motor

- 1· Basic motor theory
- 2· Operation of, and factors affecting output power, torque, speed and direction of rotation of DC motors
- 3· Series wound, shunt wound and compound motors

Transformers

1. Transformer construction principles and operation
- 2· Transformer losses and methods for overcoming them
- 3· Transformer action under load and no-load conditions
- 4· Power transfer, efficiency, polarity markings
- 5· Calculation of line and phase voltages and currents
- 6· Calculation of power in a three phase system
- 7· Primary and Secondary current, voltage, turns ratio
- 8· power, efficiency

9. Auto transformers

Filters

1. Operation, application and uses of the following filters:
2. low pass, high pass, band pass, band stop.

AC Generators

1. Rotation of loop in a magnetic field and waveform produced
2. Operation and construction of revolving armature and revolving field type AC generators
3. Single phase, two phase and three phase alternators
4. Three phase star and delta connections advantages and uses
5. Permanent Magnet Generators, inverters components and function
6. AC power generation, power distribution

Rectifiers

1. Type of rectifier.
2. Construction of copper oxide
3. Selenium rectifier
4. Half and full wave rectifier
5. Emergency power generation.

AC Motors

1. Construction, principles of operation and characteristics of:
2. AC synchronous and induction motors both single and polyphase
3. Methods of speed control and direction of rotation
4. Methods of producing a rotating field: capacitor, inductor, shaded or split pole

AIRCRAFT ELECTRICITY PRACTICAL

- 1- Lead acid batteries
 - a) Familiarization with Safety precautions
 - b) Familiarization with Checking of battery condition and adjustment of specific gravity of electrolyte,
 - c) Familiarization with battery charging practice
 - d) Familiarization with capacity, discharge and insulation test; others

- 2- **Nickel cadmium batteries**
 - a) Familiarization with safety precautions
 - b) Familiarization with checking of battery condition
 - c) Familiarization with determining state of charge, cell balancing, charging, etc.
 - d) Familiarization with checking of electrolyte level and insulation tests,
 - e) Familiarization with safety precautions
 - f) Familiarization with deep cycling of nickel cadmium units

- 3- Study and sketch different types of electrical measuring instruments

- 4- To measure the insulation resistance of cable with the help of megger

- 5- Practice of making series and parallel circuit.

- 6- To measure size of wire with the help of wire gauge
 - a) Familiarization with safety precautions
 - b) Familiarization with checking of battery condition and adjustment of specific gravity of electrolyte.
 - c) Familiarization with battery charging practice
 - d) Familiarization with capacity discharge and insulation test others

- 7- Practice of soldering, crimping,

- 8- Familiarization with protecting device and their testing

- 9- Familiarization with various parts of DC motors and function

- 10- Study the operation of transformer and testing

- 11- Familiarization with various parts of AC generators and function

- 12- Familiarization with various parts of Voltage REGulator and function

- 13- Familiarization with various parts of Alternator and function

- 14- Familiarization with various parts of inverter and function

- 15- Familiarization with various parts of AC motor and function

3.4 ROTORS

L T P
7 3 -

Rationale:

Knowledge of aircraft propeller construction, material and various designs is a matter of special interest to aircraft engineers.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	20	-	-
2.	Topics No. 2	20	-	-
3.	Topics No. 3	20	-	-
4.	Topics No. 4	20	-	-
Total		80	-	80

DETAILED CONTENTS

1. Main Rotor System

- a) Rotors Heads, semi rigid rotor heads
- b) Fully articulated rotor heads, rotor blades
- c) Rotor head maintenance- blade alignment
- d) static main rotor balance, vibration , tracking
- e) Span wise dynamic balance, blade sweeping
- f) Electronic balancing, dampener maintenance
- g) Counter weight adjustment, auto-rotation adjustment
- h) Ground resonance

2. Main Rotor Transmissions

- a) Engine transmission couplings, driveshaft
- b) clutch, freewheeling units, sprag clutch
- c) Roller unit, torque meter, rotor brake
- d) Vibrations, mounting systems,

3. Tail Rotor system

operation, tail rotor system, servicing, tail rotor track, alignment ,system rigging
Static and dynamic balancing, Vibration types, vibration reduction methods,

4. Tail Rotor Transmissions

Gear boxes, main and tail rotors, Clutches, free wheel units and rotor brake Tail
Rotor Drive shafts, flexible coupling, bearings, vibration dampers and bearing hangers

Rotors Practical

1. Familiarization with Rotors Heads, semi rigid rotor heads
2. Familiarization with Fully articulated rotor heads, rotor blades
3. Familiarization with Rotor head maintenance- blade alignment
4. Familiarization with static main rotor balance, vibration , tracking
5. Familiarization with Span wise dynamic balance, blade sweeping
6. Familiarization with Electronic balancing, dampener maintenance
7. Familiarization with Counter weight adjustment, auto-rotation adjustment
9. Familiarization with Engine transmission couplings, driveshaft
10. Familiarization with clutch, freewheeling units, sprag clutch
11. Familiarization with Roller unit, torque meter, rotor brake
12. Familiarization with Vibrations, mounting systems
13. Familiarization with operation, tail rotor system, servicing, tail rotor track, system rigging
14. Familiarization with tail rotor transmission

IV Semester

4.1 THEORY OF FLIGHT

L T P
9 3 -

Rationale :

This paper equips the maintenance engineer with the insight of pre and post requisites of flight. It will facilitate him in his work to meet the desired objectives of flights.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	20	8	-
2.	Topics No. 2	35	8	-
3.	Topics No. 3	20	8	-
4.	Topics No. 4	15	8	-
5.	Topics No. 5	15	8	-
6.	Topics No. 6	20	8	-
7.	Topics No. 7	20	8	-
Total		145	56	

DETAILED CONTENTS

Physics of the Atmosphere

International Standard Atmosphere (ISA), application to aerodynamics

Aerodynamics

Airflow around a body

Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, upwash and downwash, vortices, stagnation

The terms: camber, chord, mean aerodynamic chord, profile (parasite) drag, induced drag, centre of pressure, angle of attack, wash in and wash out, fineness ratio, wing shape and aspect ratio

Thrust, Weight, Aerodynamic Resultant

Generation of Lift and Drag: Angle of Attack, Lift coefficient, Drag coefficient, polar curve, stall

Aerofoil contamination including ice, snow, frost

Relationship between lift, weight, thrust and drag

Glide ratio

Steady state flights, performance

Theory of the turn

Influence of load factor: stall, flight envelope and structural limitations

Lift augmentation

Flight Stability and Dynamics

Longitudinal, lateral and directional stability (active and passive)

Rotary Wing Aerodynamics

Terminology

Effects of gyroscopic precession

Torque reaction and directional control

Dissymmetry of lift, Blade tip stall

Translating tendency and its correction

Coriolis effect and compensation

Vortex ring state, power settling, overpitching

Auto-rotation

Ground effect

Flight Control Systems

Cyclic control

Collective control

Swash plate

Yaw control: Anti-Torque Control, Tail rotor, bleed air

Main Rotor Head: Design and Operation features

Blade Dampers: Function and construction

Rotor Blades: Main and tail rotor blade construction and attachment

Trim control, fixed and adjustable stabilizers

System operation: manual, hydraulic, electrical and fly-by wire

Artificial feel Balancing and Rigging

Blade Tracking and Vibration Analysis

Rotor alignment

Main and tail rotor tracking

Static and dynamic balancing

Vibration types, vibration reduction methods, Ground resonance

Transmissions

Gear boxes, main and tail rotors, Clutches, free wheel units and rotor brake

Tail Rotor Drive shafts, flexible coupling, bearings, vibration dampers and bearing hangers

4.2 AIRCRAFT INSTRUMENT (Common to AME)

L T P
6 2 4

Rationale :

Knowledge of aircraft instruments for maintenance engineers is no way less important than that of aircraft engine. They are controlling and guiding organs of the aircraft.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time	L	T	P
1.	Topics No. 1		6	2	-
2.	Topics No. 2		6	2	-
3.	Topics No. 3		6	2	-
4.	Topics No. 4		6	2	-
5.	Topics No. 5		6	2	-
6.	Topics No. 6		10	2	-
7.	Topics No. 7		7	2	-
8.	Topics No. 8		15	2	-
9.	Topics No. 9		6	2	-
10.	Topics No. 10		6	2	-
11.	Topics No. 11		6	2	-
12.	Topics No. 12		10	2	-
Total			90	24	60

DETAILED CONTENTS

1. General introduction to aircraft instrument: various instruments and their classification
2. Altimeter, principle, constructional details, types of setting, position error, leak test and periodical inspection
3. Airspeed indicator-Pitot and static tube, construction and principle, position error & periodical inspection, leak test
4. Vertical speed indicator, constructional features checks and installation procedure, periodic inspection
5. Pressure gauges, principles of operation types of gauges, periodical inspection
6. Temperature gauge, principle of thermocouple and different type used in aviation, cylinder head temperature gauge, maintenance and periodical inspection.
7. R.P.M. indicator, constructional details types of indicators, maintenance and periodical inspection
8. Gyro instruments, principle of gyro wheel & different types of gyros, constructional details of each i.e. turn & bank indicator, artificial horizon and directional gyro, maintenance and periodical inspection, suction gauge etc,
9. Electrically operated instruments
10. Fuel flow gauge and content gauges
11. Manifold pressure gauge

12. Detailed knowledge of the procedures of replacement and in situ operational tests of all instruments (except where the use of special test instrument/equipment is required)

AIRCRAFT INSTRUMENT PRACTICAL

1. Identification of various parts of an instrument
2. Familiarization with Pitot static system
3. Familiarization with altimeter
4. Familiarization with Air speed Indicator
5. Familiarization with Vertical speed Indicator.
6. Familiarization with pressure gauge
7. Familiarization with Temperature gauge
8. Familiarization with RPM Indicator
9. Study and sketch of an air driven gyroscopic system.
10. Familiarization with Turn & Bank Indicator
11. Familiarization with Artificial Horizon
12. Familiarization with Directional Gyro
13. Familiarization with Electrical type temperature gauge.
14. Familiarization with Fuel flow gauge and content gauges.
15. Familiarization with Manifold pressure gauge

4.3 AIR CRAFT COMPASS (Common to AME)

L T P
5 1 4

Rationale:

Aircraft compass is an important instrument of aircraft. Its proper working and sensitivity is of utmost importance in flight as well as in landing, so the subject cannot be ignore for maintenance engineer.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	10	2	-
2.	Topics No. 2	12	3	-
3.	Topics No. 3	12	3	-
4.	Topics No. 4	12	2	-
5.	Topics No. 5	12	2	-
6.	Topics No. 6	12	2	-
Total		70	14	56

DETAILED CONTENTS

1. Knowledge of general principles of magnetism, magnetic materials and permanent magnets, polarity and strength of bar magnets, the earth as magnet; the magnetism and its relationship to the geographic meridian.
2. Knowledge of general principles of construction for typical aircraft direct reading compasses and remote reading compasses, including the magnet system, damping liquid, verge ring and markings, lubber line, grid wires, shock absorbing suspension and corrector box, the inspection necessary for the detection of common defects that may arise during use.
3. Knowledge of the procedure and points to be observed during installation of the compass in aircraft.
4. Knowledge of the precautions to be observed in the choice of site for swinging and preparation of a "swinging base", checking the base by means of a landing compass.
5. Knowledge of the composition of compasses in the aircraft including the observation of deviations, the calculations and adjustments necessary for corrections for co-efficient A,B, and C, the procedure to be followed after, then, corrections are made and the preparation of deviation cards and graphs.
6. Knowledge of the use of landing compass for checking the compasses in aircraft.

AIR CRAFT COMPASS PRACTICAL

1. Familiarization with P-type compass.
2. Familiarization with B-type compass.
3. Familiarization with Pivot friction test.
4. Familiarization with damping test.
5. Swinging & compensation of compass by synthetic aids
6. Actual swinging & compensation of compass installed in an aircraft.
7. Preparation of log book entries.

4.4 AIRCRAFT RECIPROCATING ENGINE-I

L T P
6 - 8

Rationale :

Engine is the source of propulsive force for the aircraft and its knowledge, principle of working is must for aircraft maintenance engineer.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	10	-	-
2.	Topics No. 2	10	-	-
3.	Topics No. 3	20	-	-
4.	Topics No. 4	10	-	-
5.	Topics No. 5	10	-	-
6.	Topics No. 6	10	-	-
7.	Topics No. 7	10	-	-
8.	Topics No. 8	10	-	-
9.	Topics No. 9	10	-	-
10.	Topics No. 10	10	-	-
Total		110	-	130

DETAILED CONTENTS

Fundamentals

Mechanical, thermal and volumetric efficiencies
Operating principles — 2 stroke, 4 stroke, Otto and Diesel
Piston displacement and compression ratio
Engine configuration and firing order

Engine Performance

Power calculation and measurement
Factors affecting engine power
Mixtures/leaning, pre-ignition

Engine Construction

Crank case, crank shaft, cam shafts, sumps
Accessory gearbox
Cylinder and piston assemblies
Connecting rods, inlet and exhaust manifolds

Valve mechanisms
Propeller reduction gearboxes

Induction, Exhaust and Cooling Systems

Construction and operation of: induction systems including alternate air systems
Exhaust systems, engine cooling systems — air and liquid

Supercharging/Turbocharging

Principles and purpose of supercharging and its effects on engine
Parameters, Construction and operation of supercharging/turbocharging systems, System terminology, Control systems, System protection

Engine Fuel Systems

Carburetors

Types, construction and principles of operation
Icing and heating

Fuel injection systems

Types, construction and principles of operation

Electronic engine control Operation of engine control and fuel metering systems including electronic engine control (FADEC) Systems lay-out and components

Lubricants and Fuels

Properties and specifications, Fuel additives, Safety precautions

Lubrication Systems

System operation/lay-out and components

AIRCRAFT RECIPROCATING ENGINE-I PRACTICAL

1. Study and sketch of working principle of four stroke engine.
2. Inspection and assembly of intake & exhaust valve.
3. Familiarize with various piston engine constructions.
4. Familiarize with construction of Crankcase.
5. Familiarize with construction of Crank shaft.
6. Familiarize with construction of Cam shafts.
7. Familiarize with construction of Sumps.
8. Familiarize with construction of Accessory gearbox.
9. Familiarize with construction of Cylinder and Piston assemblies.
10. Familiarize with construction of Connecting rods.
11. Familiarize with construction of Inlet and exhaust manifolds.
12. Familiarize with construction of Valve mechanisms.
13. Compression testing of engine cylinder by direct and differential method.
14. Inspection of piston & cylinder assembly.

5.1 AIRCRAFT RECIPROCATING ENGINE-II

L T P
8 - 8

Rationale:

Engine is the source of propulsive force for the of aircraft and its knowledge, principle of working is must for aircraft maintenance engineer.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	20	-	-
2.	Topics No. 2	30	-	-
3.	Topics No. 3	30	-	-
4.	Topics No. 4	20	-	-
5.	Topics No. 5	20	-	-
Total		120	-	120

DETAILED CONTENTS

Starting and Ignition Systems

Starting systems, pre-heat systems

Magneto types, construction and principles of operation;

Ignition harnesses, spark plugs

Low and high tension systems

Engine Indication Systems

Engine speed

Cylinder head temperature

Coolant temperature

Oil pressure and temperature

Exhaust Gas Temperature

Fuel pressure and flow

Manifold pressure

Powerplant Installation

Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains

Engine Monitoring and Ground Operation

Procedures for starting and ground run-up

Interpretation of engine power output and parameters

Inspection of engine and components: criteria, tolerances, and data specified by engine manufacturer

Engine Storage and Preservation

Preservation and depreservation for the engine and accessories/systems

AIRCRAFT RECIPROCATING ENGINE-II PRACTICAL

1. Familiarise with components and systems layout of piston engine
2. Familiarise with Fuel injection system components and operation, engine control and fuel metering systems
3. Familiarise with starting system, pre-heat system; magneto types, Ignition harnesses, spark plugs; low and high tension systems
4. Familiarise with induction systems including alternate air systems; exhaust systems and engine cooling systems, supercharging / turbo-charging systems
5. Familiarise with Indication Systems
6. Demonstrate power plant removal and installation
7. Perform representative engine systems component removal, fitment, inspection, adjustment, servicing and operational check
8. Applicable standard practices, minor fault diagnosis, differential pressure test and rectification
9. Demonstrate engine starting and ground run-up

5.2 AVIONICS

L T P
6 - 6

Rationale :

The electrical devices used in aviation make good study for aircraft maintenance engineer.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time	L T P		
			L	T	P
1.	Topics No. 1	10	-	-	
2.	Topics No. 2	10	-	-	
3.	Topics No. 3	10	-	-	
4.	Topics No. 4	10	-	-	
5.	Topics No. 5	10	-	-	
6.	Topics No. 6	20	-	-	
7.	Topics No. 7	10	-	-	
8.	Topics No. 8	10	-	-	
Total		90	-	-	90

DETAILED CONTENTS

Avionics general test equipment:

-operation, function and use of avionics general test equipment Memory associated terms, Operation of typical memory devices, Operation, advantages and disadvantages of various data storage system.

Avionic Systems

Fundamentals of system lay-outs and operation of Auto Flight (ATA 22), Communications (ATA 23), Navigation Systems (ATA 34).

Electronic displays

Principles of operation of common types of displays used in modern aircraft including cathode ray tubes, light emitting diodes and liquid crystal display.

Electrostatic sensitive devices

special handling of components sensitive to electrostatic discharge, Awareness of risk and possible damage, component and personnel, anti-static protection devices.

Software Management Control

Awareness of restrictions, airworthiness requirements and possible catastrophic effects of unapproved changes to software programmes.

Download and use of software.

Electromagnetic Environment

Influence of the following phenomena on maintenance practices for electronic system:

EMC-Electromagnetic Compatibility EMI Electromagnetic Interference HIRF-

High Intensity Radiated Field Lightning/lightning protection

Servomechanisms

Understanding of the following terms: Open and closed loop systems, feedback, follow up, analogue transducers

Principles of operation and use of the following synchro system

components/features: resolvers, differential, control and torque, transformers inductance and capacitance transmitters.

- Understanding of the following terms: Open and closed loop, follow up, servomechanism, analogue, transducer, null, damping, feedback, dead band
- Construction operation and use of the following synchro system components: resolvers, differential, control and torque, E and I transformers, inductance transmitters,
- capacitance transmitters, synchronous transmitters
- Servomechanism defects, reversal of synchro leads, hunting.

Fibre Optics

- Advantages and disadvantages of fibre optic data transmission over electrical wire propagation
- Fibre optic data bus
- Fibre optic related terms
- Terminations
- Couplers, control terminals, remote terminals
- Application of fibre optics in aircraft systems

Typical Electronic/Digital Aircraft Systems

- General arrangement of typical electronic/digital aircraft systems and associated BITE(Built In Test Equipment) testing such as:
- ACARS-ARINC Communication and Addressing and Reporting System
- ECAM-Electronic Centralised Aircraft Monitoring
- EFIS-Electronic Flight Instrument System
- EICAS-Engine Indication and Crew Alerting System
- FBW-Fly by Wire
- FMS-Flight Management System
- GPS-Global Positioning System
- IRS-Inertial Reference System
- TCAS-Traffic Alert Collision Avoidance System

AVIONICS PRACTICAL

1. Recognition and testing of diodes with AVO meter
2. Recognition and reading the value of resistances with colour codes
3. Recognition the types of capacitors and reading their values
4. Elementary working principle of simple auto pilot system
5. Different types of auto pilots
6. Components of auto pilot system, description and operation
7. Integration of flight director system and horizontal situation indicator with auto pilot operation
8. Familiarization with Software management control
9. Familiarization with Electromagnetic environment
10. Testing of transistors, Usage of bonding tester on aircraft

5.3 BASIC COMPUTERS

L T P
3 - 7

Rationale:

Computer are being used for management informative. An introduction to the computer system is required to understand and make use of computer in an effective way. This subject is purely designed to make student of ATI to understand computer in the Real Aircraft Maintenance World.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time	L	T	P
1.	Topics No. 1		5	-	-
2.	Topics No. 2		5	-	-
3.	Topics No. 3		5	-	-
4.	Topics No. 4		5	-	-
5.	Topics No. 5		5	-	-
6.	Topics No. 6		5	-	-
7.	Topics No. 7		5	-	-
8.	Topics No. 8		5	-	-
9.	Topics No. 9		5	-	-
10.	Topics No. 10		5	-	-
Total			50	-	100

DETAILED CONTENTS

1.Basic Computer Structure

- Computer terminology (including bit, byte, software, hardware, CPU, IC, and various memory devices such as RAM, ROM, PROM)
- Computer technology (as applied in aircraft systems).
- Computer related terminology

2. Communication and storage

- Operation, layout and interface of the major components in a micro computer including their associated bus systems
- Information contained in single and multi address instruction words
- Memory associated terms, Operation of typical memory devices
- Operation, advantages and disadvantages of the various data storage systems.

3. Microprocessors

- Functions performed and overall operation of a microprocessor;
- Various Types of Microprocessor with Chip no.
- Basic operation of each of the following microprocessor elements: control and processing unit, clock, register, arithmetic logic unit.
- Uses of medium, large and very large scale integration.

4. Multiplexing

- Operation, application and identification in logic diagrams of multiplexers and demultiplexers.

5. Numbering Systems

- Numbering systems: binary, octal and hexadecimal
- Demonstration of conversions between the decimal and binary, octal and hexadecimal systems and vice versa

6. Data Conversion

- Analogue Data, Digital Data
- Operation and application of analogue to digital, and digital to analogue converters, inputs and outputs, limitations of various types.

7. Data Buses

- Operation of data buses in aircraft systems, including knowledge of ARINC and other specifications.

8. Logic Circuits

- Identification of common logic gate symbols, tables and equivalent circuits;
- Applications used for aircraft systems, schematic diagrams.
- Interpretation of logic diagrams.

9. Integrated Circuits

- Description and operation of logic circuits and linear circuits/operational amplifiers.
- Description and operation of logic circuits and linear circuits
- Introduction to operation and function of an operational amplifier used as: integrator, differentiator, voltage follower, comparator
- Operation and amplifier stages connecting methods: resistive capacitive, inductive (transformer), inductive resistive (IR), direct

- Advantages and disadvantages of positive and negative feedback.

10. Printed Circuit Boards

- Description and use of printed circuit boards.

BASIC COMPUTER PRACTICAL

1. Command line interface (e.g. DOS).
2. Use the features and utilization of a Word processing software/application (MS word, open office etc.).
3. Use the features and utilization of a spreadsheet software/application (e.g. Ms excel, open office etc.)
4. Use the features and utilization of a Presentation software/application (e.g. Ms PowerPoint, open office etc.)
5. Selection of command in a GUI based operating system (e.g. windows, Linux) .
6. Practices on E-mail and websites.
7. Inventory & preventive maintenance package. Written specially for aircraft maintenance organizations.
8. Familiarisation with operation of a microprocessor.

5.4 HELICOPTER AIRFRAME

L T P
2 - 8

Rationale :

Airframe specifics maintenance needs their proper knowledge. The paper projects considerable light on salient points of Chetak.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	2	-	-
2.	Topics No. 2	2	-	-
3.	Topics No. 3	2	-	-
4.	Topics No. 4	2	-	-
5.	Topics No. 5	2	-	-
6.	Topics No. 6	2	-	-
7.	Topics No. 7	2	-	-
8.	Topics No. 8	2	-	-
9.	Topics No. 9	2	-	-
10.	Topics No. 10	2	-	-
11.	Topics No. 11	2	-	-
12.	Topics No. 12	2	-	-
13.	Topics No. 13	2	-	-
14.	Topics No. 14	2	-	-
Total		28	-	112

DETAILED CONTENTS

HELICOPTER AIRFRAME

1. Introduction to Chetak helicopter
2. Basic type of construction features materials used. Advantage and disadvantages of this of structure
3. Type of control surfaces used in this helicopter and their control movements
4. Rigging of controls.
5. Air-conditioning system & operating principles, servicing & functional test
6. Description & operation of retractable landing gear, brake & wheel
7. Detailed knowledge of fuel system
8. Type instruments fitted to aircraft, their basic operating principles
9. Introduction to aircraft electrical system, power generating and voltage control system and associated components, starting system & environmental control system
10. Knowledge of helicopter wiring diagrams
11. Helicopter performance assessment procedure
12. Knowledge of various utility systems provided for helicopter

13. Auto pilot and Flight Director system brief description

14. General knowledge for current airworthiness publication for the helicopter

HELICOPTER AIRFRAME PRACTICAL

1. Familiarisation with periodical schedules upto 100 hrs./90 days inspection schedules
2. Servicing, cleaning and lubrication
3. Inspection and maintenance of vacuum pump and associated components
4. Familiarisation with Landing gear extension/retraction & emergency extension
5. Familiarisation with Oleo filling and charging
6. Familiarisation with Rigging of control surfaces
7. Brake bleeding operation and fitting of brake master cylinder
8. Inspection of wing attachment bolts & replacement procedure
9. Inspection of air-conditioning & auto pilot system & their functional tests
10. Familiarisation with helicopter weighing and preparation of Weight schedules procedure
11. Familiarisation with Filling of log books

VI Semester**6.1 ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT (Common to AME)**

L	T	P
4	-	-

Rationale:

A diploma student must have the knowledge of different types of pollution caused due to industrialization and construction activities, so as he may help in balancing of eco-system and control pollution by providing controlling measures. They should be also aware of the environmental laws for effectively controlling the pollution of environment. The topics are to be taught in light of legislation Para-3.

TOPIC WISE DISTRIBUTION OF PERIODS:

SL. NO.	TOPIC	L	T	P
1.	Topics No. 1	6	-	-
2.	Topics No. 2	36	-	-
3.	Topics No. 3	6	-	-
4.	Topics No. 4	6	-	-
5.	Topics No. 5	6	-	-
TOTAL		60	-	-

DETAILED CONTENTS**1. INTRODUCTION :**

- Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigation, urbanization, road development and other engineering activities and their effects on ecology and eco system, Mining and deforestation and their effects.
- Lowering of water level , Urbanization.
- Biodegradation and Biodegradability, composting, bio remediation, Microbes .Use of bio pesticides and bio fungicides.
- Global warning concerns, Ozone layer depletion, Green house effect, Acid rain, etc.

2. POLLUTION :

Sources of pollution, natural and man made, their effects on living environments and related legislation.

2.1 WATER POLLUTION :

- Factors contributing water pollution and their effect.
- Domestic waste water and industrial waste water. Heavy metals, microbes and leaching metal.
- Physical, Chemical and Biological Characteristics of waste water.
- Indian Standards for quality of drinking water.
- Indian Standards for quality of treated waste water.
- Treatment methods of effluent (domestic waste water and industrial/ mining waste water), its reuse/safe disposal.

2.2 AIR POLLUTION :

Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, CO, CO₂, NH₃, F, CL, causes and its effects on the environment.

- Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e.
 - A. Settling chambers
 - B. Cyclones
 - C. Scrubbers (Dry and Wet)
 - D. Multi Clones
 - E. Electro Static Precipitations
 - F. Bog Fillers.
- Ambient air quality measurement and their standards.
- Process and domestic emission control
- Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV.

2.3 NOISE POLLUTION :

Sources of noise pollution, its effect and control.

2.4 RADIOACTIVE POLLUTION :

Sources and its effect on human, animal, plant and material, means to control and preventive measures.

2.5 SOLID WASTE MANAGEMENT :

Municipal solid waste, Biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

3. LEGISLATION :

Preliminary knowledge of the following Acts and rules made there under-

- The Water (Prevention and Control of Pollution) Act - 1974.
- The Air (Prevention and Control of Pollution) Act - 1981.
- The Environmental Protection (Prevention and Control of Pollution) Act -1986.
 - Rules notified under EP Act - 1986 Viz.
 - # The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000
 - # The Hazardous Wastes (Management and Handling) Amendment Rules, 2003.
 - # Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.
 - # The Noise Pollution (Regulation and Control) (Amendment) Rules, 2002.
 - # Municipal Solid Wastes (Management and Handling) Rules, 2000.
 - # The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003.

4. ENVIRONMENTAL IMPACT ASSESSMENT (EIA):

- Basic concepts, objective and methodology of EIA.
- Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

5. DISASTER MANAGEMENT:

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan. Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

6.2 JET ENGINE

L T P
10 - 10

Rationale :

Jet engine is also a kind of air craft engine. Knowledge of various kinds of engine used in aircraft and inspection procedure is vary essential for maintenance personals.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time		
		L	T	P
1.	Topics No. 1	7	-	-
2.	Topics No. 2	7	-	-
3.	Topics No. 3	7	-	-
4.	Topics No. 4	7	-	-
5.	Topics No. 5	7	-	-
6.	Topics No. 6	7	-	-
7.	Topics No. 7	7	-	-
8.	Topics No. 8	7	-	-
9.	Topics No. 9	7	-	-
10.	Topics No. 10	7	-	-
11.	Topics No. 11	7	-	-
12.	Topics No. 12	7	-	-
13.	Topics No. 13	7	-	-
14.	Topics No. 14	7	-	-
15.	Topics No. 15	7	-	-
16.	Topics No. 16	7	-	-
17.	Topics No. 17	7	-	-
18.	Topics No. 18	7	-	-
19.	Topics No. 19	7	-	-
20.	Topics No. 20	7	-	-
21.	Topics No. 21	7	-	-
22.	Topics No. 22	7	-	-
Total		154	-	150

DETAILED CONTENTS

1.Fundamentals

Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle
The relationship between force, work, power, energy, velocity, acceleration
Constructional arrangement and operation of turbojet, turbofan, turboshaft, turboprop.

2.Engine Performance

Gross thrust, net thrust, choked nozzle thrust, thrust distribution
resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption

Engine efficiencies

By-pass ratio and engine pressure ratio
Pressure, temperature and velocity of the gas flow
Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations.

3.Inlet

- Compressor inlet ducts
- Effects of various inlet configurations
- Ice protection

4.Compressors

Axial and centrifugal types
Constructional features and operating principles and applications
Fan balancing
Operation
Causes and effects of compressor stall and surge
Methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades, Compressor ratio.

5.Combustion Section

Constructional features and principles of operation

6.Turbine Section

Operation and characteristics of different turbine blade types

Blade to disk attachment

Nozzle guide vanes

Causes and effects of turbine blade stress and creep

7.Exhaust

Constructional features and principles of operation

Convergent, divergent and variable area nozzles

Engine noise reduction

Thrust reversers

8.Bearings and Seals

Constructional features and principles of operation

9.Lubricants and Fuels

Properties and specifications

Fuel additives

Safety precautions

10. Lubrication Systems

System operation/lay-out and components.

11. Fuel Systems

Operation of engine control and fuel metering systems

including electronic engine control (FADEC)

Systems lay-out and components

12. Air Systems

Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.

13. Starting and Ignition Systems

Operation of engine start systems and components

Ignition systems and components

Maintenance safety requirements

14. Engine Indication Systems

Exhaust Gas Temperature/Interstage Turbine Temperature

Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems

Oil pressure and temperature

Fuel pressure and flow

Engine speed

Vibration measurement and indication

Torque

Power

15. Power Augmentation Systems

Operation and applications

Water injection, water methanol

Afterburner systems

16. Turbo-prop Engines

Gas coupled/free turbine and gear coupled turbines

Reduction gears

Integrated engine and propeller controls

Overspeed safety devices

17. Turbo-shaft engines

Arrangements, drive systems, reduction gearing, couplings, control systems.

18. Powerplant Installation

Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.

19. Fire Protection Systems

Operation of detection and extinguishing systems

20. Engine Monitoring and Ground Operation

Procedures for starting and ground run-up

Interpretation of engine power output and parameters

Trend monitoring (including oil analysis, vibration and boroscope)

Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer

Compressor washing/cleaning

Foreign Object Damage

21. Engine Storage and Preservation

Preservation and depreservation for the engine and accessories/systems

22. Auxiliary Power Units (APUs)

Purpose, operation, protective systems

JET ENGINE PRACTICAL

1. Familiarization with constructional arrangement of turbojet / turbofan / turbo shaft / turboprop,
2. Familiarization with various inlet configurations; engine inlet, Axial and centrifugal types of compressor
3. Familiarization with constructional features of combustion section, different types of turbine blade; blade to disk attachment; nozzle guide vanes, exhaust and various types of bearings
4. Familiarise with component and systems layout and perform operation of Engine lubrication system,
5. Familiarise with component and systems layout and perform operation of fuel system including, fuel metering systems, air distribution and anti-ice control, sealing and external air services,
6. Familiarise with component and systems layout and perform operation of start and ignition systems, fire detection and extinguishing systems, Indication Systems -Exhaust Gas Temperature/ Interstate Turbine Temperature,
7. Familiarise with component and systems layout and perform operation of Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure and flow; Engine speed; Power indication system
8. Familiarise with gas coupled/free turbine; Reduction gears; Integrated engine and propeller controls; Over speed safety devices of turbo-prop engine and its operation.
9. Familiarise with arrangements, drive systems, reduction gearing, couplings, control systems of turbo-shaft engines and its operation.
10. Demonstrate power plant removal and installation.
11. Applicable standard practices, minor fault diagnosis, perform representative engine systems component removal, fitment, inspection, adjustment, servicing and operational check.
12. Demonstrate engine starting and ground run-up

6.3 AERO ENGINE (HELICOPTER)

L T P
4 - 14

Rationale:

Engine specifics maintenance needs their proper knowledge. The paper projects considerable light on salient points of helicopter engine.

TOPIC WISE DISTRIBUTION OF PERIODS

Sl.No.	Topics	Coverage Time	L	T	P
1.	Topics No. 1		5	-	-
2.	Topics No. 3		5	-	-
3.	Topics No. 5		5	-	-
4.	Topics No. 7		5	-	-
5.	Topics No. 9		5	-	-
6.	Topics No. 11		5	-	-
7.	Topics No. 1		5	-	-
8.	Topics No. 3		5	-	-
9.	Topics No. 5		5	-	-
10.	Topics No. 7		5	-	-
11.	Topics No. 9		5	-	-
Total			55	-	190

DETAILED CONTENTS

1. Constructional of turbo shaft engine of Chetak helicopter.
2. Inlet configurations of compressor
3. Constructional features of combustion section, different types of turbine blade; blade to disk attachment; nozzle guide vanes, exhaust and various types of bearings
4. Component and systems layout and operation of engine lubrication system,
5. component and systems layout and operation of fuel system including, fuel metering systems, air distribution and anti-ice control, sealing and external air services,
6. Component and systems layout and operation of start and ignition systems, fire detection and extinguishing systems, indication systems exhaust gas temperature/ interstage turbine temperature,
7. Component and systems layout and operation of engine pressure ratio, engine turbine discharge pressure or jet pipe pressure systems; oil pressure and temperature; fuel pressure and flow; engine speed; power indication system
8. Gas coupled/free turbine; reduction gears; integrated engine and propeller controls; over speed safety devices of turbo-prop engine and its operation.
9. Arrangements drive systems, reduction gearing, couplings, control systems of turbo-shaft engines and its operation.
10. Power plant removal and installation.
11. Engine starting and ground run-up

AERO ENGINE (HELICOPTER) PRACTICAL

1. Familiarization with constructional arrangement of turbo shaft engine of Chetak Helicopter
2. Familiarization with various inlet configurations of compressor
3. Familiarization with combustion section, different types of turbine blade; blade to disk attachment; nozzle guide vanes, exhaust and various types of bearings
4. Familiarise with component and systems layout and perform operation of Engine lubrication system,
5. Familiarise with component and systems layout and perform operation of fuel system including, fuel metering systems, air distribution and anti-ice control, sealing and external air services,
6. Familiarise with component and systems layout and perform operation of start and ignition systems, fire detection and extinguishing systems, Indication Systems -Exhaust Gas Temperature/ Interstate Turbine Temperature,
7. Familiarise with component and systems layout and perform operation of Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure and flow; Engine speed; Power indication system
8. Familiarise with gas coupled/free turbine; Reduction gears; Integrated engine and propeller controls; Over speed safety devices of turbo-prop engine and its operation.
9. Familiarise with arrangements, drive systems, reduction gearing, couplings, control systems of turbo-shaft engines and its operation.
10. Demonstrate power plant removal and installation.
11. Applicable standard practices, minor fault diagnosis, perform representative engine systems component removal, fitment, inspection, adjustment, servicing and operational check
12. Demonstrate engine starting and ground run-up

6.4 PROJECT

Student in groups/individually the given maintenance work of major/minor assembly, subassembly of aircraft. They will prepare a report of their work which should contain: Its objective, Identification of work elements, their sequencing, Time schedule, Work procedure facilities/resources wanted. Inspection of parts decision making whether recondition or replace - Manpower wanted, estimated expenditure. Testing after maintenance.

Two periods per week are allotted for this work. The project contains 150 marks, the breakup is as follows

Viva-Voce - 80 Marks

Documentation - 20 Marks

Sessional Marks - 50 Marks

LIST OF EQUIPMENT

Sl.No.	NAME OF EQUIPMENT	Qty.	COST
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A. MACHINE/FITTING SHOP

1.	Bench Vices	6	
2.	Hacksaw with frame	6	
3.	Power Saw	1	
4.	Hammer ball peen	6	
5.	Hammers cross peen	6	
6.	Hammers straight peen	6	
7.	Hammers soft head	6	
8.	Files set	6	
9.	Steel Rule	6	
10.	Fitter Square	6	
11.	Punches (Set)	6	
12.	Calipers (Set containing internal external and hermaphrodite)	6	
13.	Scribing block	6	
14.	Vee block	5 Pairs	
15.	Surface Plate (Cost Iron)	6	
16.	Surface Plate (Granite)	1	
17.	Hand Drill Machine	6	

18. Power Drill Machine (Bench)	2
19. Drill Bits	10 Sets
20. Reamers	10 Sets
21. Taps	4 Sets
22. Die	4 Sets
23. Micrometer English (External)	5 Sets
24. Micrometer English (Internal)	5 Sets
25. Micrometer Metric (External)	5 Sets
26. Micrometer Metric (Internal)	5 Sets
27. Vernier Calipers	10
28. Screw Thread Gauge	5
29. Bench Grinder	2
30. Screw Driver Sets	6 Sets
31. Sheet Cutter	6
32. Pliers	6
33. Lathe Machine (3 Ft. Bed)	4
34. Lathe Machine (6 Ft. Bed)	1
35. Production Lathe	1
36. Capstain lathe	1
37. Hot & Cold chisels	6 Set Each
38. Arbor press	1
39. Combination Set	4
40. Milling Machine	1
41. Shaping Machine	1
42. Hardness Tester	
(A) Brinell Tester	1
(B) Pockwell Tester	1

B. CARPENTARY SHOP :

1. Carpenter's Saw	6
2. Jack Planes Wooden	6
3. Jack Planes Metal	6
4. Chisels firmer	6

Sl.No. NAME OF EQUIPMENT Qty. COST

5. Chisels Mortise	6
6. Anger Bit	6 Sets
7. Measuring & Marking Tools	6 Sets
8. Power Saw	2
9. Carpentar's Bench Vice	6
10. Carpentar's Lathe (3 Feet)	1

C. WELDING SHOP :

1. Gas Welding Set	2
2. Oxygen and Accetylene Cylinder (Spare)	1 Each
3. Electric Arc Welding Machine (Transformer Type)	2
4. Argon Arc Welding Machine	1
5. Goggle (Gas Welding)	6
6. Spark Lighter	2
7. Wire Brush	6
8. Eye shield for electric arc welding	6
9. Soldering Iron	6

10. Blow Lamp 2

D. ENGINE SHOP :

1. Mock up of fuel system 1
2. Mock up of ignition system 1
3. Mock up of oil system 1
4. Exploded view of engine 1
5. Continental A-65 Engine 1
6. One continental O-45 engine for 1
imparting training and associated
tools for carrying out job.
7. Turbine Engine 1
8. Spanner Set (Ring) 1
9. Spanner Set (Open) 1
10. Deep Socket (3/8 " square head) 4 Set
11. Socket (1/4" Square head) 4 Set
12. Extensions 4 Sets
13. T-Handle 4
14. Ratchet Handle 6
15. Cylinder Mercer Gauge 3
16. Pin Hole Gauge 3 Sets
17. Telescoping 4"
18. Depth Gauge (Vernier) 5
19. Height (Vernier) 5
20. Depth Gauge (Micrometer Type) 5
21. Dial Test Indicator 4
22. Valve Lappers 6

23. Compressor	1
24. Valve spring Compression Tester Feel	2
25. Feeler Gauge (In Thous)	6
26. Float Level Test Ring	2
27. Eomb Tester	1
28. Meggar	1
29. Magneto Test Rig.	1
30. Torque Spanner (Dial Type)	1
31. Torque Spanner (Racchet Type)	1
32. Piston Engine Compression Tester	1

Sl.No.	NAME OF EQUIPMENT	Qty.	COST
--------	-------------------	------	------

33. Compressor Pdg	1
34. De-greasing Plant	1
35. Pre-oiling Rig.	1
36. Prop Balancing Test Rig.	1
37. Persian Blue	1
38. Mallet	4

E. AIRFRAME SHOP

1. Mock up of pneumatic system	1
2. Mock up of tydraulic system	1
3. Flight Controls Balancing Rig	1
4. Working Model of Hydraulic Brake	1
5. Hose Pressure TestingRig.	1
6. One Complete Aircraft Ofr	1
7. Ufrtvsttishr and Associated Tools	1
8. Swaging Tool	4

9. Circlip Pliers (Internal)	2 Sets
10. Circlip Pliers (External)	2 Sets
11. Grease Gun	1
12. Portable Magnaflux Equip.	2
13. De-Magnetisation Rig.	1
14. Flourscent Inspection Equip	1
15. Cherry Rivet Gun	3
16. Clico Fasteners Pliers	2 Sets
17. Tire Pressure Gauge	2
18. Pneumatic Revetting Gun	2
19. Snap and Dolly	6 Sets
20. Ezy-Cut Extractor	2
21. Moly Tester	2
22. Cable Tensiometer	2
23. Fabric Strength Tester	2
24. Doping Mask	5
25. Fabric Sticking Needles	5 Sets
26. Straight Edge	2
27. Sprit Level	2
28. Plumb Bob	2
29. Avery Seales (Consisting of 3 scales)	1 Sets
30. Trammel	2
31. Allen Key Set	2
32. "C" Spammer	4
33. Adkistale Spanner	2
34. Griplier	2
35. Plep Charging Rig.	1
36. Cable Splicing Tools	4 Sets

37. Universal Testing Machine	1
F. ELECTRICAL SHOP	
1. Mock Up of all electrical generally on aircraft	1
2. Generator	1
3. Electrical Landing Light (Retractable)	1
4. Bat. Charging room for both lead acid and Nicad Battery	1
5. Heigh Rate discharge Tester	1
6. A. V. Aids, Color Monitor with	
I. Slide Projector	1
II. Film Projector	1
III. Overhead Projector	1
7. Wheet Stone Bridge	2
8. Multimeter	2
9. Continuity Tester	2
10. Millivolt Drop Tester	2
11. Battery Charger	2
12. Hydrometer	2
13. Pipette	2
G. INSTRUMENT SHOP	
1. Dead Weight Tester	1
2. Compressor (Small)	1
3. Glass Case (Airtight)	1
4. Monometer	1
5. Glass Jars	10

- 6. Pitot Static System Leak Test Rig. 1
- 7. Instrument Makers Screw Driver 2 Sets

BASIC ELECTRICITY AND ELECTRONICS ENGINEERING LAB

Sl. No.	Equipment	Qty.	Price
1.	Ammeter -dynamometer type portable, moving coil, permanent magnet 150 mm uniform scale		
	a. Range 0 - 2.5 - 5 Amp.	2	1200
	b. Range 0 - 50 mA	1	500
	c. Range 0 - 500 mA	2	1000
2.	Ammeter - moving iron type Portable moving iron permanent magnet, 150 mm uniform scale		
	a. Range 0 - 5 Amp.	2	1000
	b. Range 0 - 10/20 Amp.	2	1000
	c. Range 0 - 500 mA/1000 mA	2	1000
3.	Voltmeter dynamometer type portable moving coil permanent magnet 150 mm uniform scale		
	a. Range 0 - 5/10 V	2	1000
	b. Range 0 - 15/30 V	1	1000
	c. Range 0 - 50 mv/100 mv	1	1000
	d. Range 0 - 125/500 V	1	1000
	e. Range 250/500 V		

4. Digital multimeter	1	3000
3.5 digit - display		
D.C. voltage 0 - 1000 V in 5 steps		
A.C. voltage 0 - 750 V in 5 steps		
Resistance 0 - 20 M ohm in 6 steps		
D.C. 0 - 10 A in 6 steps		
A.C. 0 - 10 A in 6 steps		
Power supply 9 V.		
5. Analog multimeter (Portable)	1	1000
D.C. Voltage 0 0 1000 V		
AC Voltage 0 2/5/10/25/100/250/1100 V.		
Resistance 0 200 M ohm		
DC 0 - 50 micro Amp./1 mA/10 mA/100mA/1A/10A		
AC 0 - 100 mA/1A/25 A/10A		
6. Wattmeter single phase (LPF= 0.2)	2	5000
portable dynamometer type, scale 150 mm		
current range 0 - 5/10 Amps		
voltage Range 0 - 250/500 V		
7. Decade resistance box	1	1000
constantan coils, single dial		
10x10, 10x100, 10x1000, 10x10,000 ohms		
8. Continuously variable 0 - 1000 micro	1	1000
farad, 250 V		
9. Energymeter single phase	1	2000
induction type, industrial		
grade 5 A or 10 A, 250 V, 50 Hz.		
10. Energymeter(Substandard)	1	3000
single phase, induction type		

	5 A/10A, 250 V, 50 Hz.		
11. Power factor meter		1	5000
	dynamometer type, eddy current		
	damping, 50 Hz, scale length 150 mm		
	range upto 20 amp, voltage range		
	300 V 10 F. range 0.5 log, unity 0.5 load.		
12. Frequency meter (Reed type)		1	500
	230 V, range for having 21 reeds		
	for 40-60 Hz range.		
13. Rheostat			
	sliding rheostats wound with		
	evenly oxidised iron free nickel		
	copper on vitreous enamelled round		
	steel tube 150 ohms 2 Amps.	1	600
	110 ohms 2.5 Amps.	1	600
14. Variable inductor		1	2000
	single phase, 250 V, 2.5 KVAR		
	continuously variable		
15. Cathode ray oscilloscope 10 MHz		1	10,000
	dual beam oscilloscope		
	vertical defection		
	band width DC-10 MHz (-3db)		
	rise time 30 ms		
	deflection coefficient 12		
	horizontal defection		
	band width 1 MHz (+6db)		
16. Battery charger		1	1000
	12 V silicon bridge rectifier		

AC input 230 V, DC output suitable for charging 6 V And 12 V batteries provided with MC voltmeter 0 - 20 V and ammeter 0 - 5 A		
17. Capacitors		
2.5 microfarad, electrolytic type	4	200
18. Q Meter		
frequency 0 - 30 MHz		
Q 0 to 500	1	4000
19. LCR meter (digital)	1	8000
3.5 digit display		
capacitance 0 to 20,000 microfarad		
inductance 0 to 200 Henry		
resistance 0 to 20 M ohms		
20. LCR/Q bridge	1	5000
capable of measuring resistance, inductance and capacitance of range 8 amps, 0.012 to 10 M ohms, 4 to 10,000 H, 0.5 pico farad to 10 F.		
21. Kelvin double bridge		
10 x 0.1 ohms circular slide wire devided into 200 equal parts		
22. Energy meter 3 phase	1	5000
induction type, 4 wire, industrial grade, 50 Hz, 10 A, 440 Volt		
24. Energy meter (Sub standard)		
3 phase, 4 wire, 440 V, 10A, 50 Hz		

induction type.		
25. Transformer single phase		1 5000
core type, 230/110 V, 1 KVA, 50 Hz.		
26. Universal shunt		1 2000
0 - 75 A		
27. Current transformer		1 2000
10/25/50/5A as per IS 4201/1967		
and 2705/1981		
28. Potential transformer		1 2000
10 VA, 415/110 V as per IS		
4201/1967 and 2705/1981		
29. Strain guage		1 1000
30. Maxwells bridge		1 1000
31. Weins bridge	1	1000
32. Schering bridge	1	1000
33. Single Phase AC Watt Hour Meter	1	1200
(Electronic Energy Meter) 240V,50 C/s		
10 Amp.,		
34. 3 Phase Four Wire (3X240V between Line To	1	2500
Nuetral) AC static Watt Hour Meter		
(Electronic Energy Meter) 10A		
35. Trivector Meter	1	5000

Helicopter Lab

Sl. No.	Equipment	Qty.	Price
1.	Mockup of functioning of Swashplates of helicopter systems	1 set	
2.	Helicopter landing light system mock up	1 set	
3.	Mockup of functioning of collective and cyclic mixing unit etc. of helicopter system	1 set	
4.	Helicopter fuel quantity and fuel flow indication principle mockup	1 set	
5.	Helicopter lifting principle mockup	1 set	
6.	Medium landing compass	1	
7.	Helicopter main rotor torque neutralizing principle and Turning principle mock ups	1 set	
8.	Helicopter instrument panel mockup	1 set	

BASIC COMPUTER
COMPUTER CENTRE

S.No.	DESCRIPTION	QTY.	APPROX. COST
	(in Rs.)		
1	PENTIUM-IV 2.4 Ghz or latest	16	8,000,00=00
	RAM-256 MB or latest	(15+1Server)	
	HDD-80 GB latest		
	MONITOR COLOUR 17" AGP 16 MB		
	52X MM KIT(52x CD Drive, Speaker,sound card)		
	FDD - 1.44 MB		
	Key Board - 107 Keys Multimedia		
	Mouse - Optical Fibre Mouse		
	32 Bit PCI ETHERNET CARD(10/100) Mbps		
	Pre loaded Windows XP OR WINDOWS 2000		
	Pre loaded Norton Anti Virus with licence media and manual		
	OR		

Computer of latest Specification

Software :

- i. Noval Netware/NT Latest Version 01 55000
- ii WINDOWS - XP/WINDOWS 2000 /Windows NT 01 6000
- iii. MS OFFICE XP 01 17000
- iv. Dos latest version. 01 5,000
- v. FoxPro 2.5 or Latest Version 01

3. Hardware

- i. Internal Modem 56 kbps
 - ii. Hubs-16 port, all accessories related to Networking.
 - iii. Scanner- A4 01 10,000
4. 132 Column 600 CPS or faster 01 15,000
- 9 Pin dot matrix printer with
500 million character head life
5. Laser Jet 01 20,000
6. 5 KVA on line UPS with minimum 01 1,75000
- 30 minute battery backup along
with sealed maintenance free
batteries. Provision for connecting
external batteries with network
connectivity.
7. Window Air Conditioner 1.5 tones 04 30,000(EACH)
- capctity with ISI mark alongwith
electronic voltage stablizer with
over viltage and time delay circuit
8. Room preparation and furniture LS

XII. LEARNING RESOURCE MATERIALS

1. LCD Projector with Screen 1 -- 20000
2. Handicam 1 -- 30000
3. Cutting, Binding & Stitching 1 -- 30000
equipment.
4. Desk Top Computer with Internet 1 -- 40000
Core i5/i7- 760, Processor,
Genuine Windiw 7, Professional
18 inch HD, Flat Panel Monitor
Optical Mouse, Key Board & all
related media or latest version
5. Home Theater 1 -- 25000
Support Disc type CD. CDR/CDRW
DVDR/DVDRW, VCD Supported with
USB Port Support-DIVX/JPEG/MP3
6. Commerical P A System 1 -- 20000
16 W-220W output, AC & 24V DC
Operated, 5 Mic. & 2 Auxilary
input, Speaker output 4 Ohm,
8 Ohm, 17 V & 100 V
7. Interactive Board 1 -- 50000

ote :

1. This center will be only one at the institute level
irrespective of all branches.

Helicopter Lab

Sl. No.	Equipment	Qty.
1.	Mockup of functioning of Swashplates of helicopter systems	1 set
2.	Helicopter landing light system mock up	1 set
3.	Mockup of functioning of collective and cyclic mixing unit etc. of helicopter system	1 set
4.	Helicopter fuel quantity and fuel flow indication principle mockup	1 set
5.	Helicopter lifting principle mockup	1 set
6.	Medium landing compass	1
7.	Helicopter main rotor torque neutralizing principle and Turning principle mock ups	1 set
8.	Helicopter instrument panel mockup	1 set
9.	Main Rotor blade	2
10.	Tail Rotor Blade	4
11.	Turboshaft engine	1
12.	Swash plate	1

ANNEXURE-I QUESTIONNAIRE

INSTITUTE OF RESEARCH,DEVELOPMENT AND TRAINING U.P.KANPUR -208024

SUBJECT: Questionnaire for ascertaining the functional requirements of Three Year(Six Semester Diploma holders in Aircraft Maintenance Engineering(Helicopter and Power Plant)& inputs to improve the existing curriculum accordingly employment opportunities awaiting them.

PURPOSE: Revision of curriculum for Three Year Diploma in Aircraft Maintenance Engineering(Helicopter and Power Plant).

NOTE: 1.Please answer the questions to the points given in the questionnaire.
2.Any other point or suggestion not covered in this questionnaire may be written on a separate paper and enclosed with the questionnaire.

1.Name of the organisation:_____

2.Name & Designation of the officer _____
filling the questionnaire _____

3.Name of the department/section/ _____
shop _____

4.Important functions of the _____
department/section/shop _____

5.Number of diploma holder employees
under your charge in the area of _____
Air Craft Maintenance Engineering
(Helicopter and Power Plant).
and number existing vacancies.

6.Please give names of modern equipments/machines handled by a
diploma holder in Air Craft Maintenance Engineering
(Helicopter and Power Plant).

1. 2. 3.
4. 5. 6.

7.What proficiencies are expected from a diploma holder in
Air Craft Maintenance Engineering(Helicopter and Power Plant).

1. 2. 3.
4. 5. 6.

8.Mention the approximate percentage of the following desired in
Diploma teaching.

1. Theoretical knowledge -----%

- 2. Practical knowledge -----%
- 3. Skill Development -----%

9. Do you think " on the job training" / Industrial training should form a part of curriculum. (Yes/ No)

- if yes then
- (a) Duration of training -----
 - (b) Mode of training
 - 1. Spread over different semesters
 - 2. After completion of course
 - 3. Any other mode

10. What mode of recruitment is followed by your organisation.

- 1. Academic merit
- 2. Written test
- 3. Group discussion
- 4. Interview
- 5. On the job test.

11. Mention the capabilities/ Qualities looked for while recruiting diploma holder in Air Craft Maintenance Engineering (Helicopter and Power Plant).

- (a) Technical knowledge -----
- (b) Practical skill -----
- (c) Etiquettes and behaviour -----
- (d) Aptitude -----
- (e) Health habit and social background -----
- (f) Institution where trained -----

12. Which type of assignment do you suggest for an entrepreneur in Air Craft Maintenance Engineering(Avionics).

13. In which types of organisations can a diploma holder in Air Craft Maintenance Engineering(Helicopter and Power Plant). can work or serve.

- | | | |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |

14. Job prospects for the diploma holder in Air Craft Maintenance Engineering(Helicopter and Power Plant) the next ten years in the state/country.

15. In your opinion what should be the subjects to be taught to a diploma student in Air Craft Maintenance Engineering (Helicopter and Power Plant).

- | | |
|--------|-----------|
| Theory | Practical |
|--------|-----------|

16. Kindly mention particulars regarding topics/areas which should be given more emphasis in the curriculum .

- | | |
|--------|-----------|
| Theory | Practical |
|--------|-----------|

17. Kindly state whether your organisation can contribute towards improvement of curriculum in above field. Yes/ No
If yes : Please give names of experts in your organisation willing to do something in this respect
18. Kindly give your valuable suggestions for being considered at the time of finalisation of curriculum.
19. What changes in technologies are to be incorporated in the development of curriculum in Air Craft Maintenance Engineering(Helicopter and Power Plant).

(Signature)

Kindly mail the above questionnaire duly filled to:-

M P SINGH BHADAURIA
HOD(MECHANICAL ENGINEERING)
Institute of Research,Development & Training,U.P.
Govt. Polytechnic Campus
Kanpur-208024

(Please note that all information in this survey is confidential for the use of curriculum revision only)