CURRICULUM FOR THREE YEAR

DIPLOMA COURSE IN

AIRCRAFT MAINTENANCE ENGINEERING
(HELICOPTER AND POWER PLANT)
Effective from Session

Semester System

UNDER DEVELOPMENT

Prepared By

Curriculum Development Cell

INSTITUTE OF RESEARCH,DEVELOPMENT & TRAINING, U.P., KANPUR

APPROVED BY

BOARD OF TECHNICAL EDUCATION
U.P. LUCKNOW,on dated 04.05.2017

Corrected and Approved by B.T.E. on Dated 04.05.2017

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

I Semester

Curriculum							Scheme of Examination								
Periods Per Week						S U B J E C T	Theory			Practical			Grand Total		
Lec.	Tutorial	Draw	Lab	Work Shop	Total		Examination Dur.	Sess. Marks	Total Marks	Examination Dur.	Sess. Marks	Total Marks			
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 andinstitutions of higher education be arranged on topics such as Environmental Pollution, Safety Concerns in Industry and EntreprenureDevelopment for general awareness
(6) For Community Development Work See Annexure-I
(7) Objective questions in theory examinations will be of 60 questionof 1/2 marks each with reasoning and other 04 questions will be of 5 marks each.

Corrected and Approved by B.T.E. on Dated 04.05.2017

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(To Be Effective From July 2017)

III Semester

Curriculum							Scheme of Examination							
Periods Per Week						S U B J E C T	Theory			Practical			Grand Total
Lec.	Tutorial	Draw	Lab	Work Shop	Total		Examination Dur.	Sess. Marks	Total Marks	Examination Dur.	Sess. Marks	Total Marks	
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 HelicopterSystems	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

8	3	--	--	--	11	4.1 Theory of Flight	2.5	50	20	70	--	--	--	--	70
6	--	--	6	--	12	4.2 Air Craft Reciprocating Engines-I	2.5	50	20	70	3	60	30	90	160
6	2	--	3	--	11	4.3 Air Craft Instruments	2.5	50	20	70	3	60	30	90	160
5	1	--	3	--	9	4.4 Air Craft Compass	2.5	50	20	70	3	60	30	90	160
3	--	--	2	--	5	4.5 Energy Conservation	2.5	50	20	70	3	20	10	30	100
28	6	---	14	--	48	<---------TOTAL---------->	--	250	100	350	--	200	100	300	650
						Games/NCC/Social and Cultural Activity+Community Development+ Discipline(10+20+10)									40
													Aggregate		690

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V Semester

Curriculum						SUBJECT	Scheme of Examination								
Periods Per Week							Theory				Practical				Grand Total
Lec.	Tutorial	Draw	Lab	Work Shop	Total		Examination Dur.	Examination Marks	Sess. Marks	Total Marks	Examination Dur.	Examination Marks	Sess. Marks	Total Marks	
8	-	-	8	-	16	5.1 Air Craft Reciprocating Engines-II	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	938
														70% Carry Over of V & VI	1300
															2613

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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.

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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

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LIST OF EXPERTS

A Curriculum Workshop for Development of Curriculum on the Subject " Energy Conservation" was held on 22nd January, 2018 at NITTTR, Chandigarh. The following participated in the workshop:-

S. No.	Name, Designation and Official address
From Field/Industries/Institutions of Higher Learning	
1.	Shri Jotinder Singh, Engineer-in-Chief(Retd.) Punjab State Power Corpn. Ltd.(PSPCL), Punjab
2.	Shri Punit Sharma, Asstt.General Manager, Electrical & Energy Management, Godrej Appliances Ltd. Mohali, Punjab
3.	Ms. Anu Singla, Associate Professor, Chitkara University, Rajpura, Punjab
4.	Shri Girish Kumar, UP New and Renewable Energy Development Authroity (UPNEDA), Lucknow, U.P.
5.	Sh. Lal Ji Patel, TBO/ CDC Officer, IRDT Kanpur, U.P.
6.	Shri Ravinder Kumar, Research Assistant, IRDT, Kanpur, U.P.
From NITTTR, Chandigarh	
7.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, **Coordinator**

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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.	Trignometry	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 Movier'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.

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(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 (Cp & Cv) and relationship between them. Ratio of two specific heats, specific heat of gas at low temperature, difference between vapour and gas. .

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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 adiavatic, 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. THERMODYNAICS :

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

4. OPTICS :

Nature of light, Speeds of light, Loss 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.

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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

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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 holes - 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 method such as visual inspection, hot oil and chalk method. Dye penetrant method. Meganetic particle inspection, X-ray, Ultrasonic and Eddy current
inspection, Fluro particle inspection test. NDT of composite materials.Microfilm, Micro Fiche and computerized presentation.

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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 or tube.

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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.

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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.

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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.

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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 adn analysis. Maintenance control by retiability 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 perprits, Airworthiness of ageing aircraft, Inspection of wooden aircraft, Airworthiness requirement for gliders, Microlight aircraft and hot air balloons. Flight

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manuals, pooling of aircraft, construction certification and operation of experimental/amature 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 relatied, Time pressure and deadlines, Workload - Overload and underload, Sleep and fatigue, Shift work, Alcohal, medication, srug abuse.

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1.6 WORKSHOP PRACTICES

L T P
4 - 8

Preamble :

There are basically 4 shops to workshop practice i.e. Carpentary shop, Fitting shop, Machine shop and Welding shop. The purpose is to familarization 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.

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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, identificaiton 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.

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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 filling technique and methods.

5. Exercise 3 to be filed approximate size to side 2".

6. Filling the above exercise top surface to flat.

7. Filling 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.

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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 Exernal
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 shrpening

4. Practice in Grinding and Sharpening of various types of Chisels.

5. Practice of plaining.

6. Procedure of marking different types of cut.

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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.

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II Semester(Common to AME)

2.1 MATHEMATICS-II

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.	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 Cartisian 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.

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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, Interfrence phenomena and Standing waves. Speed of sound, Production of sounds, Intensity of sound waves, Pitch and quality. Doplar's
effects and Ultrosonic 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, horigontale range and maximum horizontal range.

4. MOTION OF SETELLITES - ESCAPE VALOCITY :
   (i) Orbital speed of setellite.
   (ii) Period of revolution of setellite.
   (iii) Artificial setellite.
   (iv) Weightlessness in setellite.

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(v) Binding energy of setellite.
(vi) Max height attained and valocity of setellite.
(vii)Geo-stationery satelites
(viii)Jet propulsion theory.

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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 Scalers and Vectors quantities, Graphical representation of vactors, Composition and Resolution of force vactors, 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. Cofficient 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.

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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, Hookes law, different types of elasticity, Poission ratio, Relation between moduli. Determination of Young's modulous, 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, viscocity, Surface Tension, Importance of their knowledge in engineering field, Various kinds of fluid flows (Open and closed channels) Laminar and turbulent flows, Bernaullis equation and its application in general and in aeronautics. Introduction to Reynonds numbers.

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

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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 knowldge 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 electiricity.

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 coeffient 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

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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 avaiation. 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 capaitance 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 broblems 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 Maganetic 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 Elementry 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 Elementry idea about eddy current loss.

7. A.C.Circuits
7.1 Recapitulation of terminology, instantaeous value,maximum (peak) value, cyle, frequency,alternate current and voltage. Difference between AC and DC, Static electricity and conduction.
7.2 Equation of an alternating voltage and currenand wave shape varying sinusoidally.

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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 ciruits 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 equilivant 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 equilivant capacitance of capictors 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.

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

xi) Testing of diodes and transistors.

xii) Soldering Practices.

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2.5 AIRCRAFT MATERIALS AND MATERIAL SCIENCE

L	T	P
5	-	3

Preamble:

The aim of Aircraft Maintenance Engineering is to familarise 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 is 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 popes 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

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5. INTRODUCTION TO FERROUS MATERIALS :

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

B. Heat teratment Terms - Critical range, Annealing, Narmalizing, Heat treatment, Hardening Quenching, Tempering carburizing, case harding

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, Brinnel and universal testing machine.

6. STEEL AND ITS ALLOY :

A. Plain carbon steel, effect of indiviual 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 compositite 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 & catelysists, adhesive pre-inpregnated 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, vaccuum bagging, filament winding, wet lay-up, lightining protection & painting of composite part.
G. Safaty precautions in the use of composite material.

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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 corrossion, prevention of corrossion, method of preventing corrossion, special coating, chemical films, special paints like Abrassive Resistant Paint, Heat and corrossive resistive paints and electroplating.

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2.6 AIR LAW, C.A.R AND HUMAN FACTORS AND LIMITATION-II

L	T	P
10	-	-

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

1. 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.

2. 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.

3. 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.

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4. Airborne communication, navigation, radar and flight testing of aircraft.

5. MISCELLANEUS 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 tissue of taxy 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.

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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. Lightening Strike protection provisions.

9. Fuel Storage.

10. Structural assembly techniques: riveting, bolting, bonding: methods of surface protection, such as chromating, anodizing, painting, surface cleaning.

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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

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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

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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.

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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

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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 repellant 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

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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

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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

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. 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

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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

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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) Familirization with safety precautions

b) Familirization with checking of battery condition and adjustment of specific gravity of electrolyte.

c) Familirition with battery charging practice

d) Familirition with capacity discharge and insulation test others

7- Practice of soldering, crimping,

8- Familirition with protecting device and their testing

9- Familirition with various parts of DC motors and function

10- Study the operation of transformar and testing

11- Familirition with various parts of AC generators and function

12- Familirition with various parts of Voltage REgulator and function

13- Familirition with various parts of Alternator and function

14- Familirition with various parts of inverter and function

15- Familirition with various parts of AC motor and function

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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**

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Gear boxes, main and tail rotorș,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

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IV Semester

4.1 THEORY OF FLIGHT

L	T	P
8	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	16	6	-
2.	Topics No. 2	30	6	-
3.	Topics No. 3	20	6	-
4.	Topics No. 4	10	6	-
5.	Topics No. 5	15	6	-
6.	Topics No. 6	20	6	-
7.	Topics No. 7	20	6	-
	Total	112	42	

DETAILED CONTENTS

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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

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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

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4.2 AIRCRAFT RECIPROCATING ENGINE-I

L	T	P
6	-	6

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	6	-	-
2.	Topics No. 2	6	-	-
3.	Topics No. 3	15	-	-
4.	Topics No. 4	6	-	-
5.	Topics No. 5	6	-	-
6.	Topics No. 6	6	-	-
7.	Topics No. 7	9	-	-
8.	Topics No. 8	10	-	-
9.	Topics No. 9	10	-	-
10.	Topics No. 10	10	-	-
	Total	84	-	84

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

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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

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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.

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4.3 AIRCRAFT INSTRUMENT **(Common to AME)**

L	T	P
6	2	3

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	4	2	-
2.	Topics No. 2	4	2	-
3.	Topics No. 3	4	2	-
4.	Topics No. 4	6	2	-
5.	Topics No. 5	6	2	-
6.	Topics No. 6	10	4	-
7.	Topics No. 7	7	2	-
8.	Topics No. 8	15	4	-
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	84	28	42

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,

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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

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4.4 AIR CRAFT COMPASS **(Common to AME)**

L T P

5 1 3

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	42

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

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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.

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4.5 ENERGY CONSERVATION

L	T	P
3	-	2

RATIONALE

The requirement of energy has increased manifolds in last two decades due to rapid urbanization and growth in industrial/service sector. It has become challenging task to meet ever increasing energy demands with limited conventional fuels and natural resources. Due to fast depletion of fossil fuels and a tremendous gap between supply and demand of energy, it is essential to adopt energy conservation techniques in almost every field like industries, commercial and residential sectors etc. Energy conservation has attained priority as it is regarded as additional energy resource. Energy saved is energy produced. This course covers the concepts of energy management and its conservation. It gives the insight to energy conservation opportunities in general industry and details out energy audit methodology and energy audit instruments.

DETAILED CONTENTS

1. **Basics of Energy**

   1.1 Classification of energy- primary and secondary energy, commercial and non-commercial energy, non-renewable and renewable energy with special reference to solar energy, Capacity factor of solar and wind power generators.
   1.2 Global fuel reserve
   1.3 Energy scenario in India and state of U.P. Sector-wise energy consumption (domestic, industrial, agricultural and other sectors)
   1.4 Impact of energy usage on climate

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2. **Energy Conservation and EC Act 2001**

2.1 Introduction to energy management, energy conservation, energy efficiency and its need

2.2 Salient features of Energy Conservation Act 2001 & The Energy Conservation (Amendment) Act, 2010 and its importance. Prominent organizations at centre and state level responsible for its implementation.

2.3 Standards and Labeling

- 2.3.1 Concept of star rating and its importance
- 2.3.2 Types of product available for star rating

3. **Electrical Supply System and Motors**

3.1 Types of electrical supply system

3.2 Single line diagram

3.3 Losses in electrical power distribution system

3.4 Understanding Electricity Bill

- 3.4.1 Transformers Tariff structure
- 3.4.2 Components of power (kW, kVA and kVAR) and power factor, improvement of power factor
- 3.4.3 Concept of sanctioned load, maximum demand, contract demand and monthly minimum charges (MMC)

3.5 Transformers

- 3.5.1 Introduction
- 3.5.2 Losses in transformer
- 3.5.3 Transformer Loading
- 3.5.4 Tips for energy savings in transformers

3.6 Electric Motors

- 3.6.1 Types of motors
- 3.6.2 Losses in induction motors
- 3.6.3 Features and characteristics of energy efficient motors
- 3.6.4 Estimation of motor loading
- 3.6.5 Variation in efficiency and power factor with loading
- 3.6.6 Tips for energy savings in motors

4. Energy Efficiency in Electrical Utilities

4.1 Pumps

- 4.1.1 Introduction to pump and its applications
- 4.1.2 Efficient pumping system operation
- 4.1.3 Energy efficiency in agriculture pumps

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4.1.4 Tips for energy saving in pumps

4.2 Compressed Air System

4.2.1 Types of air compressor and its applications

4.2.2 Leakage test

4.2.3 Energy saving opportunities in compressors.

4.3 Energy Conservation in HVAC and Refrigeration System

4.3.1 Introduction

4.3.2 Concept of Energy Efficiency Ratio (EER)

4.3.3 Energy saving opportunities in Heating, Ventilation and Air Conditioning (HVAC) and Refrigeration Systems.

5 Lighting and DG Systems

5.1 Lighting Systems

5.1.1 Basic definitions- Lux, lumen and efficacy

5.1.2 Types of different lamps and their features

5.1.3 Energy efficient practices in lighting

5.2 DG Systems

5.2.1 Introduction

5.2.2 Energy efficiency opportunities in DG systems

5.2.3 Loading estimation

6 **Energy Efficiency in Thermal Utilities**

6.1 Thermal Basics

6.1.1 Types of fuels

6.1.2 Thermal energy

6.1.3 Energy content in fuels

6.1.4 Energy Units and its conversions in terms of Metric Tonne of Oil Equivalent (MTOE)

6.2 Energy Conservation in boilers and furnaces

6.2.1 Introduction and types of boilers

6.2.2 Energy performance assessment of boilers

6.2.3 Concept of stoichiometric air and excess air for combustion

6.2.4 Energy conservation in boilers and furnaces

6.2.5 Do's and Don'ts for efficient use of boilers and furnaces

6.3 Cooling Towers

6.3.1 Basic concept of cooling towers

6.3.2 Tips for energy savings in cooling towers

6.4 Efficient Steam Utilization

7 Energy Conservation Building Code (ECBC)

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7.1 ECBC and its salient features
7.2 Tips for energy savings in buildings
7.2.1 New Buildings
7.2.2 Existing Buildings

8 Waste Heat Recovery and Co-Generation

8.1 Concept, classification and benefits of waste heat recovery
8.2 Concept and types of co-generation system

9 General Energy Saving Tips

Energy saving tips in:

9.1 Lighting
9.2 Room Air Conditioner
9.3 Refrigerator
9.4 Water Heater
9.5 Computer
9.6 Fan, Heater, Blower and Washing Machine
9.7 Colour Television
9.8 Water Pump
9.9 Cooking
9.10 Transport

10 Energy Audit

10.1 Types and methodology
10.2 Energy audit instruments
10.3 Energy auditing reporting format

PRACTICAL EXERCISES

1. To conduct load survey and power consumption calculations of small building.
2. To check efficacy of different lamps by measuring power consumption and lumens using lux meter.
3. To measure energy efficiency ratio (EER) of an air conditioner.
4. To measure effect of valve throttling and variable frequency drive (VFD) on energy consumption by centrifugal pump.
5. To measure and calculate energy saving by arresting air leakages in compressor.
6. To measure the effect of blower speed on energy consumed by it.

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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

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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

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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

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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
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

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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

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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

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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

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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 de multiplexers.

5.Numbering Systems

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· 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

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(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

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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

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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

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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.

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- Physical, Chemical and Biological Characteristics of waste water.
- Indian Standards for qulity 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, GO, 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 qulaity 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.

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- 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.

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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.<u>Fundamentals</u>

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.<u>Engine Performance</u>

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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

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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

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Reduction gears
Integrated engine and propeller controls
Overspeed safety devices

17.<u>Turbo-shaft engines</u>

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

18.<u>Powerplant Installation</u>

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.<u>Fire Protection Systems</u>

Operation of detection and extinguishing systems

20.<u>Engine Monitoring and Ground Operation</u>

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.<u>Engine Storage and Preservation</u>

Preservation and depreservation for the engine and accessories/systems

22.<u>Auxiliary Power Units (APUs)</u>

Purpose, operation, protective systems

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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

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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	-	-

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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/ interstate 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

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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 of 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

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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

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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

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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 2
   (Transformer Type)

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

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5.	Condinental A-65 Engine	1
6.	One continental 0-45 engine for imparting training and associated tools for carrying out job.	1
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.	Rachet Handle	6
15.	Cylinder Mercer Gauge	3
16.	Pin Hole Gauge	3 Sets
17.	Telescoping	4"
18.	Depth Gauge (Virnier)	5
19.	Height (Virnier)	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

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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

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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 Stiching 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 1
   on aircraft
2. Generator 1
3. Electrical Landing Light (Retractable) 1
4. Bat. Charging room for both lead 1

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acid and Nicad Battery

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. Pippette 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 Syste 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

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portable, moving coil, permanent magnet 150 mm uniform scale		
a. Range 0 - 2.5 - 5 Amp.	2	1200
b. Range 0 - 50 m A	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 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.	1	3000
5. Analog multimeter (Portable)	1	1000

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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.

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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 defeection			
band width DC-10 MHz (-3db)			
rise time 30 ms			
defeection coefficient 12			
horizontal defeection			
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 microfarod, electrolytic type		4	200
18. Q Meter			
frequency 0 - 30 MHz			

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Q 0 to 500	1	4000
19. LCR meter (digital) 3.5 digit display capacitance 0 to 20,000 microfarad inductance 0 to 200 Henry resistance 0 to 20 M ohms	1	8000
20. LCR/Q bridge 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.	1	5000
21. Kelvin double bridge 10 x 0.1 ohms circular slide wire devided into 200 equal parts		
22. Energy meter 3 phase induction type, 4 wire, industrial grade, 50 Hz, 10 A, 440 Volt	1	5000
24. Energy meter (Sub standard) 3 phase, 4 wire, 440 V, 10A, 50 Hz induction type.		
25. Transformer single phase core type, 230/110 V, 1 KVA, 50 Hz.	1	5000
26. Universal shunt 0 - 75 A	1	2000
27. Current transformer 10/25/50/5A as per IS 4201/1967 and 2705/1981	1	2000

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28. Potential transformer 10 VA, 415/110 V as per IS 4201/1967 and 2705/1981	1	2000	
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 (Electronic Energy Meter) 240V,50 C/s 10 Amp.,	1	1200	
34. 3 Phase Four Wire (3X240V between Line To Nuetral) AC static Watt Hour Meter (Electronic Energy Meter) 10A	1	2500	
35. Trivector Meter	1	5000	

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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 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	

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BASIC COMPUTER

COMPUTER CENTRE

S.No.	DESCRIPTION	QTY.	APPROX. COST (in Rs.)
1	PENTIUM-IV 2.4 Ghz or latest RAM-256 MB or latest 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	16 (15+1Server)	8,000,00=00

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	

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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 miniute 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

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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

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LIST OF LABORATORY EQUIPMENT(Energy Conservation)

Sr. No	Particulars	Qty	Estimated Cost (Rs)
1.	Multimeter	1	17,000
2.	Power Analyzer	1	20,000
3.	Luxmeter	1	5,000
4.	Black Box (for checking lamp efficacy including stand and luxmeter)	1	25,000
5.	Centrifugal pump, 1 kW	1	15,000
6.	Variable Frequency drive	2	50,000
7.	Water Flow meter	1	10,000
8.	Pressure Gauge	1	2,000
9.	Experimental Set up for Valve Throttling vs VFD	1	50,000
10.	Compressor, 20 cfm, single-stage	1	50,000
11.	Air leakage meter	1	18,000
12.	Blower (2 HP)	1	8,000

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STUDENT ACTIVITIES ON ENERGY CONSERVATION/ENERGY EFFICIENCY

1. Presentations of Case Studies
2. Debate competitions
3. Poster competitions
4. Industrial visits
5. Visual Aids

COURSE OUTCOMES

After studying this course, a student will be able to co-relate and apply fundamental key concepts of energy conservation and energy management in industry, commercial and residential areas. A student will be able to:

- Define principles and objectives of energy management and energy audit.
- Understand Energy Conservation Act 2001 and its features.
- Understand various forms & elements of energy.
- Identify electrical and thermal utilities. Understand their basic principle of operation and assess performance of various equipments.
- Identify areas of energy conservation and adopt conservation methods in various systems.
- Evaluate the techno economic feasibility of the energy conservation technique adopted.

INSTRUCTIONAL STRATEGY

Teachers are expected to lay considerable stress on understanding the basic concepts in energy conservation, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject must be supplemented by demonstrations and practical work in the laboratory. Visits to industries must be carried out. Expert from industry must be invited to deliver talks on energy conservation to students and faculty.

REFERENCE BOOKS

1. Guide book on General Aspects of Energy Management and Energy Audit by Bureau of Energy Efficiency, Government of India. Edition 2015
2. Guide book on Energy Efficiency in Electrical Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
3. Guide book on Energy Efficiency in Thermal Utilities, by Bureau of Energy Efficiency, Government of India. Edition 2015
4. Handbook on Energy Audit & Environmental Management by Y P Abbi&Shashank Jain published by TERI. Latest Edition
5. **Important Links:**
   (i) Bureau of Energy Efficiency (BEE), Ministry of Power, Government of India. www.beeindia.gov.in.
   (ii) Ministry of New and Renewable Energy (MNRE), Government of India. www.mnre.gov.in.
   (iii) Uttar Pradesh New and Renewable Energy Agency (UPNEDA), Government of Uttar Pradesh. www.upneda.org.in.
   (iv) **Central Pollution Control Board (CPCB),** Ministry of Environment, Forest and Climate Change, Government of India. www.cpcb.nic.in.
   (v) Energy Efficiency Sevices Limited (EESL). www.eeslindia.org.
   (vi) Electrical India, Magazine on power and electrical products industry. www.electricalindia.in.

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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 opportinities 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 vaccancies.

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 ----------%

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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 emphasisin the curriculum .

Theory Practical

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17. Kindly state whether your organisation can contribute towards improvement of curriculum in above field.
If yes : Please give names of experts in your organisation willing todo something in this respect — Yes/ No

18. Kindly give your valuable suggestions for being considered at the time of finilisation 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)

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