CURRICULLUM OF 5TH SEMESTER

For

DIPLOMA IN AIRCRAFT MAINTENANCE ENGINEERING

(Effective FROM 2021-22 Sessions)

STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING,

ODISHA, BHUBANESWAR

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 5th Semester (AME)(wef 2020-21)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional	End Sem Exams	Exams (Hours)	Total
		Theory							
Th.1		Aircraft Engines and Maintenance	4		-	20	80	3	100
Th.2		Aircraft structure	4		-	20	80	3	100
Th.3		Aircraft system	4		-	20	80	3	100
Th.4		Aircraft maintenance & management	4			20	80	3	100
Th.5		Entrepreneurship & Management	4			20	80	3	100
		Total	20			100	400	-	500
		Practical							
Pr.1		Aircraft Engine Repair And Maintenance Lab	-	-	4	50	50		100
Pr.2		Aircraft structure Lab	-	-	4	50	50		100
Pr.3		Professional Practice	-	-	4	50			50
Pr.4		Project Phase-1			7				
		Student Centred Activities(SCA)				-	-	-	-
		Total	-	-	*19*	*159*	*100*	-	*250*
		Grand Total	**20**		**19**	**250**	**500**	**-**	**750**

Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc. ,Seminar and SCA shall be conducted in a section.

There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

TH.1. AIRCRAFT ENGINES AND MAINTENANCE

Theory: 4 periods per week **I.A : 20 Marks**
Examination: 3 hours **TOTAL MARKS : 100 Marks**

Topic-wise distribution of periods

S.L. No.	TOPICS	PERIODS
I	PISTON ENGINES	10
II	PROPELLERS	8
III	JET ENGINES	12
IV	TESTING AND INSPECTION	10
V	OVERHAULING	10

Rationale
It aims at enabling the student to familiarize with the Aircraft engine maintenance procedure and practice.

Course Outcome
To make the students to understand about piston engines and it maintenance
To make the students to understand about propeller and it maintenance
To make the students to understand about Jet engines and it maintenance
To make the students to understand about testing
To make the students to understand about inspection
To make the students to understand about over whiling

COURSE CURRICULAM

UNIT I: PISTON ENGINES

1.1 Carburation and Fuel injection systems for small and large engines
1.2 components and spark plug detail
1.3 Engine operating conditions at various altitudes
1.4 Engine power measurements
1.5 Classification of engine lubricants and fuel
1.6 Induction, Exhaust and cooling system
1.7 Maintenance and inspection check to be carried out. Inspection and maintenance and troubleshooting
1.8 Inspection of all engine components
1.9 Daily and routine checks
1.10 Overhaul procedures
1.11 Compression testing of cylinders
1.12 Special inspection schedules
1.13 Engine fuel, control and exhaust systems
1.14 Engine mount and super charger
1.15 Checks and inspection procedures.

UNIT II: PROPELLERS

1.1 Propeller theory andoperation
1.2 construction assembly and installation
1.3 Pitch change mechanism

1.4 Propeller axially system
1.5 Damage and repair criteria
1.6 General Inspection procedures
1.7 Checks on constant speed propellers
1.8 Pitch setting, Propeller Balancing, Blade cuffs, Governor/Propeller operating conditions
1.9 Damage and repair criteria.

UNIT III: JET ENGINES

1.1 Types of jet engines
1.2 Fundamental principles
1.3 Bearings and seals
1.4 Inlets, compressors, turbines, exhaust section
1.5 classification and types of lubrication and fuels
1.6 Details of control, starting around running and operating procedures
1.7 Inspection and Maintenance- permissible limits of damage and repair criteria of engine components
1.8 Internal inspection of engines
1.9 compressor washing
1.10 field balancing of compressor fans
1.11 Component maintenance procedures
1.12 Systems maintenance procedures
1.13 use of instruments for online maintenance
1.14 Special inspection procedures, Foreign Object Damage and Blade damage .

UNIT IV: TESTING AND INSPECTION

1.1 Symptoms of failure
1.2 Fault diagnostics
1.3 Case studies of different engine systems
1.4 Rectification during testing equipments for overhaul: Tools and equipments requirements for various checks and alignment during overhauling
1.5 Tools for inspection - Tools for safety and for visual inspection
1.6 Methods and instruments for non-destructive testing techniques
1.7 Equipment for replacement of parts and their repair. Engine testing: Engine testing procedures and schedule preparation
1.8 Online maintenance.

UNIT V: OVERHAULING

1.1 Engine Overhaul and Overhaul procedures
1.2 Inspections and cleaning of components
1.3 Repairs schedules for overhaul
1.4 Balancing of Gas turbine components. Trouble Shooting: Procedures for trouble shooting
1.5 Condition monitoring of the engine on ground and at altitude
1.6 Engine health monitoring and corrective methods.

TEXT BOOKS AND REFERENCES

1. Kroes & Wild, "Aircraft Power plants ", 7th Edition - McGraw Hill, New York, 1994.
2. Turbomeca, " Gas Turbine Engines ", The English Book Store ", New Delhi, 1993.
3. United Technologies Pratt & Whitney, "The Aircraft Gas turbine Engine and its Operation", The English Book Store, New Delhi.

Syllabus to be covered up to I.A-Chapters 1,2 &3

TH.2. AIRCRAFT STRUCTURES

Theory: 4 periods per week **I.A : 20 Marks**
Examination: 3 hours **TOTAL MARKS : 100 Marks**

Topic-wise distribution of periods

S.L. No.	TOPICS	PERIODS
I	AIR FRAME CONSTRUCTION AND INTRODUCTION TO FIXED WING AIRCRAFT,AND LOCATION NUMBERING SYSTEM	8
II	FUSELAGE OF AIRCRAFT	10
III	WING STRUCTURES	10
IV	BASICS OF NACELLES/PODS	10
V	MAIN CONTROL SURFACES	6
VI	LOADS ON AIRCRAFT	8

Rationale:

1. It aims at enabling the student to understand & analyze the structural construction of the aircraft and the various loads acting on the structure.

Course Objectives:

To know the basics of airframe construction ,configurations and location numbering systems in use.
To identify various types of fuselage construction
To know various wing structures and its types
To understand nacelles and honeycomb structures
To Illustratevarious flight control surfaces and its significance and uses
To Differentiate between various loads acting on aircraft and appreciate the flight envelope through V-n diagram.

UNIT I: AIR FRAME CONSTRUCTION AND INTRODUCTION TO FIXED WINGAIRCRAFT,AND LOCATION NUMBERING SYSTEM

1.1 AIR FRAME CONSTRUCTION:
1.1.1 Structural members
1.2. FIXED WING AIRCRAFT
1.2.1 Identification and explanation of aircraft structural components for
a. typical fixed wing, single engine, propeller driven aircraft.
b. typical fixed wing, multi engine aircraft
1.3 LOCATION AND NUMBERING SYSTEM
1.3.1 Purpose of the location numbering system
1.3.2 Station diagram for an aircraft fuselage.

UNIT II: FUSELAGE OF AIRCRAFT
2. FUSELAGE OF AIRCRAFT
2.1 Fuselage-Basic explanation of fuselage
2.2 TYPES OF FUSELAGE WITH DIAGRAMS
2.2.1 Truss type fuselage
2.2.2 Monocoque type fuselage
2.2.3 Semi-monocoque type

UNIT III: WING STRUCTURES
3. WING STRUCTURES
3.1 Wing structures -general explanation of three fundamental designs for wing structure:-
3.1.1 Mono spar
3.1.2 Multi spar
3.1.3 Box Beam

3.2 Wing configurations-Introduction
3.2.1 No of wings
3.2.2 position of wings
3.2.3 wing support
3.2.4 wing plan form (aspect ratio, wing sweep, chord variation, asymmetrical)
3.2.5 tail plane and fore plane
3.2.6 dihedral / anhedral
3.2.7 leading edge / trailing edge shapes
3.3 SPARS AND RIBS
3.3.1 Purpose and general explanation of spars with types and construction
3.3.2 Purpose and general explanation of ribs with types and construction

UNIT IV: BASICS OF NACELLES/PODS,
4. BASICS OF NACELLES/PODS,
4.1 Explanation of Nacelles / pods, engine mounts
4.2 Cowlings
4.3 Skin & Fairing
4.4 Access and inspection doors.
4.5 Aircraft painting and finishing
4.5.1 Explanations of importance and requirements of painting of aircraft,
4.5.2 Types of paints
4.5.3 methods of painting
4.5.4 defects in painting
4.6 BASICS OF HONEY COMB SECTION WINGS
4.6.1 Basic diagram & Explanation
4.6.2 types of honeycomb structures
4.6.3 Areas of application

UNIT V. **MAIN CONTROL SURFACES**
5.1 Explanation and purpose of main control surfaces
5.2 classification of main control surfaces
5.3 primary control surfaces (explanation of ailerons, elevator and rudder)
5.4 Secondary control surfaces (explanation of tabs etc..)

UNIT VI. LOADS ON AIRCRAFT
6.1 concept of basic loads and other Types of loads on the aircraft
6.2 Load factor ,Limit load and Design load and its implications
6.3 Concept of gust loads
6.4Load factor –velocity V-n diagram, explanation and its importance

TEXT BOOKS AND REFERENCES:
Aircraft structures vol II By Dr. Lalit Gupta and O.P.Sharma
FAA Airframe and powerplant mechanics airframe hand book: AC65:15A Fundamental of aircraft structure By. Barton Millard

TH.3. AIRCRAFT SYSTEMS

Theory: 4 periods per week **I.A : 20 Marks**
Examination: 3 hours **TOTAL MARKS : 100 Marks**

Topic-wise distribution of periods

S.L. No.	TOPICS	PERIODS
I	INTRODUCTION TO AIRCRAFT SYSTEM	6
II	AIRCRAFT FUEL SYSTEM	10
III	AIRCRAFT FLIGHT CONTROL SYSTEM	10
IV	AIRCRAFT REMOTE CONTROL SYSTEMS MEDIA, UNDERCARRIAGE SYSTEM	14
V	AIRCRAFT ENVIRONMENT SYSTEMS	6
VI	AIRCRAFT EMERGENCY SYSTEMS	6

Rationale:
1 It aims at enabling the student to understand & analyze the operations of various types of aircraft systems.

Course Objectives:
To **know** about various aircraft systems
To **understand** various aircraft fuel systems
To **understand** and differentiate various flight control systems
To **know** about various remote control systems and to **understand** the working ofundercarriage system
To **know** about environmental and pressurization systems and **apply** the knowledge to select proper fire extinguishers
To **understand** the ice and rain protection system

UNIT I. INTRODUCTION TO AIRCRAFT SYSTEM
1. Systems concept-Introduction
1.1. Requirements of a system:
1.1.1Stability
1.1.2 Reliability
1.1.3 Flexibility
1.1.4 Maintainability
1.2 AIRCRAFT SYSTEMS
1.2.1 Primary performance systems:
1.2.1.1 Aircraft structural system
1.2.1.2 Propulsion system
1.2.1.3 Primary flying control surface system
1.2.1.4 Under carriage System
1.2.2 Performance Aid systems:
1.2.2.1 Secondary and tertiary flying control Surfaces
1.2.3 Active air Induction system
1.2.4 Augmentation & Thrust reversal systems
1.2.5Environmental Systems:
1.2.5.1 Ventilation system
1.2.5.2 Air conditioning system
1.2.5.3 Oxygen system
1.2.5.4Pressurisation system
1.2.6 Safety systems:
1.2.6.1 Fire warning & extinguishing systems
1.2.6.2 Escape Aid systems

1.2.7 Media systems;
1.2.7.1 Mechanical
1.2.7.2 Hydraulic
1.2.7.3 Pneumatic
1.2.7.4 Electro-Hydraulic
1.2.7.5 Electro-Pneumatic
1.2.7.6Electrical

UNIT II. AIRCRAFT FUEL SYSTEM

2.1 AIRCRAFT FUEL SYSTEM- Classification based on functional basis-
2.1.1 Airframe fuel system
2.1.2Power plant fuel system
2.2 Basic airframe fuel system
2.3 Additional features of airframe fuel system
2.4 Venting-Basic purpose of venting system.
2.5 Booster Pump- need for booster pump and limitations of gravity fuelfeed system
2.6 Filter-Need for strict quality control for aviation fuel.
2.7 Information system-
2.7.1 Fuel contents
2.7.2 Fuel Pressure
2.7.3 Low/critical fuel level warning
2.8 Modern airframe fuel systems-
2.8.1 Explanation with basic schematic for a multi -engine fuel system
2.9 Weight of dispersed fuel :-Affect on stability &manoeuvrability of aircraft
2.10 Flexibility-minimum vulnerability to total system failure by any one of the components.
2.11 Safety-Protection of the systems from hazards of requirement, various operating conditions.

UNIT III. AIRCRAFT FLIGHT CONTROL SYSTEM

3Introduction to flight control systems
3.1 Axes of Motion- Vertical - Longitudinal -Lateral
3.2 PRIMARY CONTROL SURFACES-Elevator/Stabilizer, Aileron & Rudder.
3.3 SECONDARY CONTROL SURFACES-Flaps, slats, spoilers dive brakes
3.4 Tertiary Control Surfaces-Trim Tabs.
3.5 Primary flight controls:-Pitch-Roll- Yaw - Throttle
3.6 Secondary effects of controls:
3.6.1 Pitch-elevator-how speed is controlled by Secondary effects of elevator.
3.6.2 Roll-Aileron-how yaw is achieved
3.6.3 Yaw-Rudder-Aileron less rudder only
3.7 Main Control Surfaces:
3.7.1 Ailerons-Placing, purpose, action
3.7.2 Elevators-Placing, purpose, action
3.7.3 Rudder-Placing, purpose, action
3.8 Trim Tabs: Purpose, Placing, action
3.9 Spoilers-Purpose, use,
3.10 Flaps-Placing, purpose, action,
3.11 Slats-Placing, purpose, action
3.12 Air Brakes-Placing, purpose, action
3.13 General arrangement of Aircraft Flight Control Systems (AFCS):
3.13.1 Control yoke for roll that moves AILERONS,
3.13.2 Control column for PITCH that moves the elevators,
3.13.3 Rudder pedals for YAW that moves the rudder.
3.14 Classification of flight control systems (FCS)
3.14.1 Mechanical FCS
3.14.2 Hydro-Mechanical FCS/Powered flight control units (PFCU)
3.14.3 Fly-by-wire (FBW)
3.14.3.1 Analog Fly by wire FCS
3.14.3.2 Digital fly by wire FCS
3.14.3.3) Power-by-wire FCS
3.14.3.4 Intelligent FCS

UNIT IV.AIRCRAFT REMOTE CONTROL SYSTEMS MEDIA, UNDERCARRIAGE SYSTEM

4.1 Introduction-concept of remote control system, basic principles used.
4.2 Explanation of basic manual control system using mechanical media.
4.3 Advantages and disadvantages of mechanical media in Aircraft remote Control systems
4.4 Application areas for mechanical media systems.
4.4.1 Flying controls,
4.4.2 Engine controls,
4.4.3 Operation of control valves and Selector valves.
4.5 Examples of commonly used mechanical media systems, units brief explanations:-
4.5.1 Multi stranded cable system with pullies, drums etc
4.5.2 Chain & sprocket system – common examples
4.6 Explanation of a typical mechanical media push-pull control system- with diagram
4.7 Chain and cable controls-Introduction
4.8 Chain control-Brief explanation of how chain control is used for controlling aircraft, control surface movements.
4.9 Inspection and maintenance on chain control system: Routine and periodical.
4.10Aircraft cables-control cables, their specifications and strands.
4.11 Cable Maintenance.
4.12 Introduction to hydraulic system and brief discussion on properties of fluids useful for this system.
4.13 Hydraulic fluid medium:
4.13.1 General properties of hydraulic fluid.
4.13.2 Incompressibility of hydraulic fluid.
4.13.3 Liquid pressure and PASCAL'S law.
4.14 Aircraft hydraulic fluid-Important properties of aircraft hydraulic fluids:-
4.14.1 Viscosity
4.14.2 Low Freezing point
4.14.3 High Boiling point
4.14.4Flight flash and fire points
4.14.5 Chemical and physical stability
4.14.6Compatibility
4.14.7 Lubricity
4.15 Aircraft hydraulic fluid specifications &colours of Fluids
4.16 Explanation of a simple closed loop

HYDRAULIC SYSTEM- Vehicle Brake System.
4.17 Description of a simple pump-powered hydraulic system.
4.18 AIRCRAFT REMOTE CONTROL SYSTEM- PNEUMATIC MEDIA
4.18.1 Introduction-Pneumatic media systems
4.18.2 Special qualities of Air and typical applications in aircraft:
4.18.2.1 Pressure energy storage-under carriage blow-down systems,
4.18.2.2 Compression-shock absorbers
.
AIRCRAFT UNDERCARRIAGE SYSTEMS
4.19 Purpose and functions of Aircraft under carriage system.
4.20 Systems requirement for under carriages.
4.21 Classification of under carriages:
4.21.1 By general configuration of the 3 point support with reference to the Airframe.
4.21.2 Tail under carriage type with 2 main Undercarriages located in wings.
4.22 Nose undercarriage type with their main undercarriage located in the fuselage or under wings (Tricycle base)
4.22.1 By constructional features:
4.22.2 Single nose wheel and main wheel undercarriage
4.22.3 Double nose wheel and single main wheel undercarriage
4.22.4 Double nose wheel and double tandem undercarriage.
4.22.5 By operating features:-
4.22.5.1 Non retractable undercarriage mounted on fuselage or wings
4.22.5.2 Retractable undercarriage:

UNIT V.AIRCRAFT ENVIRONMENT SYSTEMS
5.1 Cabin pressurization and air conditioning systems: Introduction.
5.2 Altitude limits of tolerance for human being.
5.3 Effect of rate of change of altitude on human body.
5.4 Normal composition of cabin atmosphere in an aircraft.
5.5 Temperature, humidity and comfort zone inside aircraft cabin.
5.6 Cabin altitude, differential pressure ambient pressure
5.7 Pressurization systems-introduction
5.8 Supply of Air-engine bled supply and ram air supply.
5.8.1 Cabin pressure control-cabin pressure control value (CPCV). Important functions of CPCV.
5.8.2 Compression and explosive de-compression of aircraft cabin-cause and effects.
5.9 Aircraft air conditioning systems-introduction
5.10 Air conditioning units-boot Strap or Air cycle principle.

UNIT VI.AIRCRAFT EMERGENCY SYSTEMS
6.1Aircraft fire warning systems-Introduction
6.1.1 Common causes of fire in aircraft: Fuel, Hot gases, Electrical/Mechanical
6.1.2 Purpose and function of fire detection system.
6.1.3 Ancillary systems: Fire extinguisher systems
6.1.4 Cabin protection in civil transport aircraft-modern trend.
6.2. ICE AND RAIN PROTECTION SYSTEMS
6.2.1 Ice and Rain Protection Systems Introduction-Common flight hazards due to ice pitot tubes, control systems etc.
6.2.1.1 Areas sensitive for ice formation:
6.2.1.2 Aero foil surfaces
6.2.1.3 Engine intakes
6.2.1.4 Engine internal surfaces
6.2.1.5 Rotor blades & propellers
6.2.1.6 Wind screens
6.2.1.7 Instrument probes & vanes
6.2.1.8 Control hinges & linkages
6.2.2 Principles of operation :
6.2.2.1 Active system
6.2.2.2 Passive system
6.2.3 Ice protection systems:
6.2.3.1 Thermal (Hot Air)-Air frame.
6.2.3.2 Thermal (Hot Air)-Engine
6.2.3.3 Thermal (Electrical)
6.2.3.4 Ground De-icing-Aircraft on open parking.

TEXT BOOKS AND REFERENCES:
1. Aircraft systems by Lalitgupta&Dr.O P sharma.
2. Aircraft powerplant by Michael kroes
3. FAA Aircraft mechnics handbook AC 65-15A
4. Aircraft systems by Lalitgupta&Dr.O P sharma.
5. Aircraft powerplant by Michael kroes
6. Aircraft Systems: Mechanical, electrical, and avionics subsystems integration, Third Edition
Author(s): Ian Moir, Allan Seabridge Published Online: 10 APR 2008

TH.3. AIRCRAFT MAINTAINCE MANAGEMENT

Theory: 4 periods per week **I.A : 20 Marks**
Marks Examination: 3 hours **TOTAL MARKS : 100 Marks**

Topic-wise distribution of periods

S.L. No.	TOPICS	PERIODS
I	INTRODUCTION, MAINTAINABILITY, AVAILABILITYAND SAFETY	9
II	RELIABILITY AND FAILURE ANALYSIS	7
III	MAINTENANCE PHILOSOPHY AND ERGONOMICS	11
IV	MATERIALS MANAGEMENT AND COMPUTERIZATION OF AIRCRAFT MAINTENANCE	9
V	QUALITY, STANDARDS AND STATISTICS	8
VI	SOCIAL ISSUES AND ENVIRONMENT	8

Rationale:
1. To prepare Technicians of Aeronautical engineering disciplines to work at middle management level effectively and to deal with workforce and management problems.
2. To prepare technicians for optimum utilization of the resources with higher productivity, quality and least cost in the industry

Course Objectives:
To Know the general management principles, maintainability, availability
To Know about the importance of reliability and failure
To Know about various types of management and application of Ergonomics
To Know about material management and computerization of aircraft maintenance
To Know the application of statistics, Quality, and QMS
To Appreciate the social responsibilities of engineer and ways to protect our environment

UNIT I : INTRODUCTION, MAINTAINABILITY, AVAILABILITYAND SAFETY
1.1 Management –Definition
1.1.1. Functions of Management.
1.1.2. Types of management.
1.1.3. Introduction to Maintenance and its importance towards maintaining optimum serviceability of the aircraft.
1.1.4. Explanation of important terms like Life Cycle profitability, maintenance cost, Explanation of life Characteristic curve.
1.1.5. Definition of Maintainability.
1.1.6. Factors effecting Maintainability. Maintainability and cost.
1.1.7. Availability definition and explanation.

UNIT II : RELIABILITY AND FAILURE ANALYSIS
2.1 Reliability Concept and definition Failure Rate:
2.1.1Explanation of term. Mean Time Between Failure (MTBF).
2.1.2 Explanation of the term Hazard Rate.
2.1.3 Explanation of term areas of Reliability.
2.1.4 Explanation of the term Reliability Specification. Reliability studies: brief explanation.
2.2 Life testing and Reliability.

2.2.1 Classification of Life Testing.
2.2.2 Quality control Life Test.
2.2.3 Pilot-run life test.
2.2.4 Establishment life test.
2.2.5 Application life test.
2.2.6 Individual life test.
2.3 Concept of Failure:
2.3.1 EARLY failure,
2.3.2 CHANCE Failure,
2.3.3 Wear-Out Failure.
2.4 Explanation of Modes of failure:
2.4.1 Catastrophic failure,
2.4.2 Degradation Failure,
2.4.3 Independent Failure,
2.4.4 Secondary Failure.

UNIT III : MAINTENANCE PHILOSOPHY AND ERGONOMICS

3.1 Definition of Maintenance.
3.1.1 Objectives of maintenance.
3.1.2 Forms of maintenance.
3.1.3 Emergency maintenance.
3.1.4 Break down Maintenance.
3.1.5 Preventive Maintenance.
3.1.6 Corrective maintenance.
3.1.7 Automatic Maintenance.
3.1.8 Maintainability Vs Maintenance.
3.2 maintenance cost Analysis. Out sourcing or Contracted Maintenance.
3.3 Built in test Equipment (BITE).
3.31 Importance of BITE in Maintenance.
3.4 Total Productive Maintenance (TPM).
3.4.1 Prophylactic Maintenance.
3.4.2 Condition monitoring.
3.4.2 Predictive Maintenance.
3.5 Wear Detection and Monitoring (WDM).
3.5.1 Magnetic Chip Detector.
3.5.2 Electric Chip Detector.
3.5.3 Spectrometric Oil Analysis Program (SOAP),
3.5.4 Vibration Monitoring and Control.Vibration Check.
3.6 ERGONOMICS:
3.6.1 Basic meaning and explanation of term ergonomics.
3.6.2 Human – Machine matching. Ergonomically reasons for lay out and display.

UNIT IV: MATERIALS MANAGEMENT AND COMPUTERIZATION OF AIRCRAFT MAINTENANCE

4.1 Material management
4.1.1 definition, functions-
4.1.2 Storekeeping- classification of stores - Functions of store keeper.
4.2 Store management-
4.2.1 Bin Card
4.2.2 Material Issue Requisition
4.2.3 Material Returned Note
4.2.4 Store ledgers
4.2.5 Codification of stores-
4.3 Inventory Management
4.3.1 Definition - functions of Inventory Control
4.3.2 Advantages of Inventory Control.
4.3.3 Enterprise resource planning - concept, features and applications.-
4.3.4 Material Requirement Planning (MRP)- concept, applications
4.3.5 Just in Time (JIT)-concept and benefits-
4.3.6 Supply chain management-concept and benefits

4.4 Computerization of Aircraft Maintenance.
4.4.1 Basic data maintained with computerization:
4.4.2 Main Schedule.
4.4.3 Component Service life as applicable to that maintenance.
4.4.4 Parts Catalogue with illustration.
4.4.5 Work Card Reference. List of authorized modification and their implications.
4.4.6 Existing Technical orders and Service Instructions.
4.5 Details of Flying hours for that Aircraft.Condition of information like
4.5.1 Mechanics
4.5.2 Work areas
4.5.3 Flight destination detail etc.

UNIT V: QUALITY, STANDARDS AND STATISTICS

5.1 Quality–Concept-Quality control- Definition
5.1.1 Factors affecting quality- Advantages of quality control
5.1.2 Inspection-Different types of inspection.
5.2 Total Quality Management-Meaning-
5.2.1 Principles of total quality management- TQM,
5.2.2 Problem solving tools- Flow charts, Control charts,
5.2.3 Histograms, Pareto charts,
5.2.4 Cause and effect diagram,
5.2.5 5-S, Kaizen, and Six-sigma.
5.3 Introduction and scope of Statistics.
5.3.1 Importance of statistical data.
5.3.2 Classification of Statistical methods:Descriptive(Sampling).
5.3.3 Inductive(Inference).Sampling.
5.3.4 Merits and demerits of Sampling.
5.4 Introduction tostatistical Quality Control(SQC).
5.4.1 Control Charts: Types of control charts. Use of control charts.
5.5 Quality Certification Systems
5.5.1 ISO 9000 series quality standards,
5.5.2 quality certification procedure, AS 9100, ISO 18000, QS14000

UNIT VI: SOCIAL ISSUES AND ENVIRONMENT

6.1 Environment – Definition. Global environmental issues.
6.2 Ozone layer depletion.
6.2.1 Observations on Ozone layer depletion.
6.2.2 Consequence of Ozone layer depletion:
(a) Biological effects (b) Effects on Humans. (C) Effects on Crops.
6.3 Greenhouse effect.
6.4 Global warming & it Causes,
6.4.1 Effects of global warming on Society,
6.4.2 Acid rain. Causes and effects.
6.4.3 Different types of wastes. Causes, effects, prevention / disposal.
6.4.5 Nuclear hazards:
6.4.6 List the sources of nuclear radiation.
6.4.7 Disposal of Radio active waste.
6.4.8 Explain effects of Radiation. Explain prevention of the above.
6.4.9 Water conservation and rain water harvesting.
6.5 Regulation on pollution prevention and control.
6.5.1 Functions of Pollution Boards.
6.5.2 Environment (protection) Act, 1986.
6.5.3 Definition. General power of the Central Government.Rules to regulate Environmental Pollution.

TEXT BOOKS AND REFERENCES

1. Industrial Organization and Engineering Economics, T.R.Banga& S C Sharma, Khanna.Publishers
2 Industrial management and engineering economics, O.P.Khanna, Khannapublishers
3. Production and operations management, -Dr .K.Aswathappa And. Dr.Sreedhar Bhatt, Himalaya Publishers

4 Safety Management in Industry Krishnan.N V, Jaico Publishing House, Bombay, 1997
5 Total Quality Management S Raja Ram, Shivashankar
6 Environmental Engineering BR Sharma

PR.1. AIRCRAFT ENGINE REPAIR AND MAINTENANCE LABORATORY

Theory: 6 periods per week
Examination: 4 hours

Rationale:

To introduce the knowledge of the maintenance and repair of both piston and jet aero engines and the procedures followed for overhaul of aero engines.

Practical/Exercise:

1. Stripping of a piston engine
2. Engine (Piston Engine) - cleaning, visual inspection, NDT checks.
3. Piston Engine Components - dimensional checks.
4. Piston – Engine reassembly.
5. Propeller Pitch Setting
6. Stripping of a jet engine
7. Jet Engine – identification of components & defects.
8. Jet Engine – NDT checks and dimensional checks
9. Jet Engine – reassembly.
10. Engine starting procedures.

PR.2. AIRCRAFT STRUCTURE LAB

Theory: 6 periods per week
Examination: 4 hours

Rationale:
To enable students to locate, identify and demonstrate various aircraft structural components

Practical/Exercise:

1 Identification of structural components for typical single engine , propeller driven aircraft

2 Study of structural components for typical multiengine aircraft

3 Fuselage: Basics and study of types of fuselage and their construction details

4 Study of wing structure ,and its parts,

5 Welded single

6 Welding double V-joints

7 Fabric Patch repairs and Riveted Patch repairs

8 Tube bending and flaring

9 Sheet metal forming

10 Preparation of glass epoxy of composite laminates and specimens.

PR.3 :PROFESSIONAL PRACTICES

Course Objectives:
Professional development of Diploma engineering students is to be done by exposing them to various simulative situations in the industries. This is achieved by involving students in activities such as assigning task to create report, Group discussion, inviting experts from various industries for sharing their experiences, arranging industrial visits, seminars etc.

Information Search and Data collection: 15HRS Information search can be done through manufacturer's catalogue, websites, magazines; books etc. Following topics are suggested.

1. History of Aviation
2. Classification of Aircraft
3. Classification of Aircraft based on application
4. Different type of flight control systems
5. The student should search any relevant information of innovation principles should lead to selection of Project in Current semester.
6. Alternative materials for manufacturing
7. Composite materials
8. Nano materials
9. Special purpose machines
10. Aircraft maintenance
11. Flight and maintenance safety
12. Classification of cockpit instruments
13. Different type of navigation system
14. Different type of power plants used in aircraft
15. Different type of power plants used in Rockets 16. Different type of power plants used in Helicopter

Method for conducting Graded activities

1. The student should individually select the topic, and search the information related to topic.
2. The report is strictly hand written document to have knowledge of precise writingand report making based on data collection
3. Carry out class room presentation.

Group Discussion: (One topic)

The students shall discuss in group of six students .Some of the suggested topics are
1. Polythene bags must be banned!
2. Do we really need smart cities?
3. E – Books or Printed books – what's your choice?
4. Is Face book for the attention – seeking and lazy people?
5. Globalization and its impact on Indian Culture.
6. Analytically evaluate the solutions to traffic problems
7. Global warming is caused more by developed countries
8. Rain forests help in maintaining the earth's ecosystem
9. Reservation for women would help the society
10. How to deal with terrorism
11. Water resources should be nationalized
12. Daughters are more caring than sons
13. NGOs - Do they serve people's interests?
14. Managers are born, not trained 15. Managerial skills learnt in the classroom
16. Women are good managers 17. India's growth rate is bridging gap between rich and poor. 18. Nuclear power is a safe source of energy
19. Electronic media vs. print media
20. Corruption is the price we pay for democracy 21. Multinational corporations: Are they devils in disguise?
21. **Any ethical discussion can value add to students**

Methodology for conducting Group discussion/Seminar

1. The teacher will allot a topic for a group of six students
2. The teacher should give an introductory talk on Ways and rules to carry out group discussion
3. The students should ask to show interest with others and work effectively with them to meet common objective. The teacher should provide tips to accept feedback in a constructive and considerate way and how to handle frustrations in group, while discussion.
4. The placement officer and any other senior faculty of the institute/ HOD of other departmentshould be invited and they should act as observing members, apart fromteacher
5. The teacher should fix up the time duration for initiating and conducting the activity
6. Documentation to be produced for validation ∑ Hand written document on minutes of discussion, description of the topic discussed ∑ Record the few minutes of discussion by smart device

Guest Lecturers: To be organized

Method for conducting Guest lectures

1. The teacher/ISTE student chapter convener should fix up the date for guest lecture
2. The HOD of the department should chair the event
3. The students of class allowed to participate in the session
4. Watch the talk and make the brief hand written report on the guest lecture delivered by each student as a part of Term work.
5. Make Audio/visual record of the guest lecture by using any smart devices
6. Opportunity should be provided for students for live Interaction with experts and record it on any one smart device.

Scheme of Valuation for End Examination can be done on following

1 Report on Information Search and Data collection
2 Document on Guest Lecturer by experts
3 Report on Group discussions
4 Report on Individual assignment/ Life skill activity recorded

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LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

1. AIRCRAFT ENGINE LAB

S. No.	EQUIPMENT	Qty.
1	Multi Cylinder Petrol Engine	1
2	Propeller	1
3	Propeller pitch setting stand	1
4	Aircraft with serviceable stand	1
5	Precision instruments (Vernier Caliper, Micro meter, Cylinder bore gauge, depth gauge, Bevel Protector and DTI	1
6	NDT Equipments (Defectoscope, Dyepenetrant method, Hot oil Chalk Method	1

2. AIRCRAFT STRUCTURE LAB

No	**uipments**	**y**
1	Serviceable aircraft	1
2	Shear cutter pedestal type	1
3	Drilling Machine	1
4	Radius Bend bars	1
5	Pipe Flaring Tools	1
6	Welding machine	1
7	Glass fibre, epoxy resin	