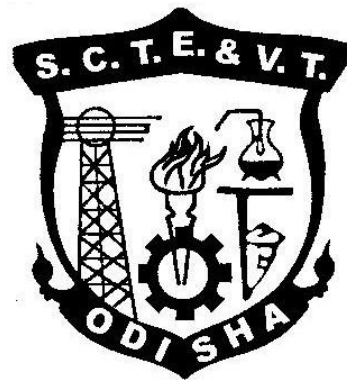


# **CURRICULLUM OF 6<sup>TH</sup> SEMESTER**

**For**

## **DIPLOMA IN AIRCRAFT MAINTENANCE ENGINEERING**

**(Effective FROM 2023-24 Sessions)**



**STATE COUNCIL FOR TECHNICAL EDUCATION & VOCATIONAL TRAINING,  
ODISHA, BHUBANESWAR**

**STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA**

**TEACHING AND EVALUATION SCHEME FOR 6th Semester (AME)(wef 2023-24)**

| Subject Number   | Subject Code | Subject  | Periods/week |          |           | Evaluation Scheme              |               |               |            |
|------------------|--------------|--|--------------|----------|-----------|--------------------------------|---------------|---------------|------------|
|                  |              |  | L            | T        | P         | Internal Assessment/ Sessional | End Sem Exams | Exams (Hours) | Total      |
| <b>Theory</b>    |              |  |              |          |           |                                |               |               |            |
| Th.1             |              | Aircraft Instrumentation   | 4            |          | -         | 20                             | 80            | 3             | 100        |
| Th.2             |              | Human Factor   | 4            |          | -         | 20                             | 80            | 3             | 100        |
| Th.3             |              | Aircraft Inspection Maintenance and repair                                     | 4            |          | -         | 20                             | 80            | 3             | 100        |
| Th.4             |              | Elective*** (Any one)<br>a) CIVIL AIRCRAFT REGULATIONS<br>b) Aircraft Avionics | 4            |          | -         | 20                             | 80            | 3             | 100        |
|                  |              | <b>Total</b>   | <b>16</b>    |          |           | <b>80</b>                      | <b>320</b>    | <b>-</b>      | <b>400</b> |
| <b>Practical</b> |              |  |              |          |           |                                |               |               |            |
| Pr.1             |              | Aircraft system Lab  | -            | -        | 4         | 25                             | 25            | 3             | 50         |
| Pr.2             |              | Aircraft Jet Engine Lab  | -            | -        | 4         | 25                             | 50            | 3             | 75         |
| Pr.3             |              | CAD/CAM lab  | -            | -        | 4         | 25                             | 25            | 3             | 50         |
| Pr.4             |              | Project Phase-II   | -            | -        | 6         | 50                             | 100           | 3             | 150        |
| Pr.5             |              | <b>LIFE SKILL</b>  |              |          | 2         | 25                             |               |               | 25         |
|                  |              | Student Centred Activities(SCA)  |              |          | 3         |                                |               |               |            |
|                  |              | <b>Total</b>   | <b>-</b>     | <b>-</b> | <b>23</b> | <b>150</b>                     | <b>200</b>    | <b>-</b>      | <b>350</b> |
|                  |              | <b>Grand Total</b>   | <b>16</b>    |          | <b>23</b> | <b>230</b>                     | <b>520</b>    | <b>-</b>      | <b>750</b> |

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 INSTRUMENTATION

Theory: 4 periods per week  
Examination: 3 hours

I.A : 20 Marks  
TOTAL MARKS : 100 Marks

## Topic-wise distribution of periods

| S.L. No. | TOPICS   | PERIODS |
|----------|--|---------|
| I        | INTRODUCTION TO AIRCRAFT INSTRUMENTATION SYSTEMS | 5       |
| II       | DISPLAYS AND TYPES OF COCKPIT DISPLAYS           | 12      |
| III      | AIR DATA BASED INSTRUMENT                        | 6       |
| IV       | GYRO BASED INSTRUMENT                            | 9       |
| V        | RADIO INDICATING COMPASS                         | 10      |
| VI       | MACHMETER  | 10      |

### Rationale

It aims at enabling the student to understand Different type of instruments used in aircraft

### Course Outcome

- To recognise the basic aircraft instrumentation and its requirements
- To know about the basic Aircraft display systems
- To understand about the main air data instruments in an aircraft
- To Identify the gyro instruments in the aircraft
- To Identify the radio indicating compass in the aircraft
- To Identify the machmeter in the aircraft.

## COURSE CURRICULAM

### UNIT I: INTRODUCTION TO AIRCRAFT INSTRUMENTATION SYSTEMS (CO1)

- 1.1.1 Introduction to Aircraft Instrumentation systems and Aircraft Requirements of Aircraft Instrumentation System,
- 1.1.2 Temperature, Humidity High gravity Forces ,
- 1.1.3 Vibration Accuracy ,
- 1.1.4 Sensitivity Reliability ,
- 1.1.5 Maintainability Size,
- 1.1.6 Weight - Cost FAIL SURE and FAIL SAFE FEATURES
- 1.1.7 Remote indication and Control.
- 1.1.8 Instrument Panels and Cockpit Layouts
- 1.1.9 Grouping of Instruments,
- 1.1.10 Flight Instruments – Basic “SIX” & BASIC “T” ,
- 1.1.11 Power Plant
- 1.1.12 Instruments, basic pitot system of aircraft

### UNITII: DISPLAYS AND TYPES OF COCKPIT DISPLAYS

- 2.1.1 Priority Consideration,
- 2.1.1 Reference frame consideration Basic Display,
- 2.1.3 Radial Displays,
- 2.1.3 Characteristics of Radial Displays.,
- 2.1.4 Digital Displays,
- 2.1.5 Characteristics of Digital Display,
- 2.1.6 Vertical Displays.,
- 2.1.7 Characteristics of Vertical Display,
- 2.1.8 Head up Display ( H.U.D) – Basic HUD system,
- 2.1.9 Important components ,H U D System,
- 2.1.10 Characteristics of HUD system .,

- 2.1.11 Other Types of cockpit Displays;
- 2.1.12 Recorded Displays, Audio Displays, Illuminated Displays, Head Down Display – HDD
- 2.1.13 Projected Map Display – PMD,
- 2.1.14 Horizontal Situation Indicator – HSI, Helmet Mounted Display,
- 2.1.15 Integrated Displays
- 2.2 Instrument Elements – Explanations of four principal elements of an instrument system with diagrams
- 2.2.1 Instrument Mechanisms, gears, Hair Springs, Bimetal Strip method

### **UNIT III: AIR DATA BASED INSTRUMENT**

- 3.1 Basic theory of operation of an Altimeter.
  - 3.1.1 Pressure altitude and indicated altitude
  - 3.1.2 'Q' Codes and their purpose. Servo controlled altimeter – advantages
  - 3.1.3 Airspeed indicator-Introduction, purpose.
  - 3.1.4 Air speed terminology and Air speed terminology diagram.
  - 3.1.5 Principle of operation of Air speed indicator.
  - 3.1.6 Square law compensation for air speed indicator.
  - 3.1.7 Introduction to ROCI and its purpose.
  - 3.1.8 Principle of operation of ROCI. Operation of ROCI for climb,
  - 3.1.9 level and dive conditions of an aircraft
  - 3.1.10 Metering unit in an ROCI and its purpose

### **UNIT IV: GYRO BASED INSTRUMENT**

- 4.1.1 Introduction to gyroscope and its application in aircraft. Gyroscope and its properties:
- 4.1.2 Rigidity, Precession,
- 4.1.3 Three degrees of freedom of a gyroscope, Gyroscopic references
- 4.1.4 Limitations of a free gyroscope, Limitations of a displacement gyroscope,
- 4.1.5 Modern trends: LASER gyroscope.
- 4.1.6 Introduction to AH- Gyro horizon principles, Electric gyro horizon
- 4.1.7 Introduction to TBI its purpose in an aircraft- Rate gyroscope and its operation,
- 4.1.8 Bank indications on dial for various conditions of flight of aircraft,
- 4.1.9 Indication of turn and slip on dial of TBI indicator, Introduction and purpose,
- 4.1.10 Magnetic Reference Heading System (MHRS), Working principle of an aircraft heading system

### **UNIT V: RADIO INDICATING COMPASS**

- 5.1 Introduction to DI/RI Compass- Basic principle of operation,
- 5.2 Radio magnetic indicator (RMI)

### **UNIT VI: MACHMETER (CO6)**

- 6.1 Introduction to mach meter,
  - 6.1.1 purpose and need for mach meter in an aircraft
  - 6.1.2 Principle of operation of mach meter

### **TEXT BOOKS AND REFERENCES**

1. Aircraft Instrument systems by EHJ Pallet
2. Aircraft Systems volume IV by Lalit Gupta and Dr OP Sharma
3. Aircraft electrical systems by JOHN KENNEDY

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

## TH.2. Human Factor

Theory: 4 periods per week  
Examination: 3 hours

I.A : 20 M  
TOTAL MARKS : 100 Marks

### Topic-wise distribution of periods

| S.L. No. | TOPICS  | PERIODS |
|----------|---|---------|
| I        | General and Human Performance and Limitations | 12      |
| II       | Social Psychology                             | 6       |
| III      | Factors Affecting Performance                 | 6       |
| IV       | Physical Environment and Tasks                | 9       |
| V        | Communication                                 | 8       |
| VI       | Human Error and Hazards in the Workplace      | 8       |

### Rationale

To enable the students to gain a thorough knowledge about the working of jet engines and to identify its components, their location and functions.

### Course Objective

- To understand the General and Human Performance
- To understand the various types of Social Psychology
- To understand the types of Factors Affecting Performance
- To understand the types of Physical Environment and Tasks
- To understand the working with Communication
- To understand the Human Error and Hazards in the Workplace

### COURSE CONTENT

#### UNIT I: General and Human Performance and Limitations

- 1.1 The need to take human factors into account
- 1.2 Incidents attributable to human factors/human error;Murphy's' law.
- 1.3 Human Performance and Limitations
- 1.4 Vision; Hearing;
- 1.5 Information processing;
- 1.6 Attention and perception;
- 1.7 Memory;
- 1.8 Claustrophobia and physical access.

#### UNIT II: Social Psychology

- 2.1 Responsibility:
- 2.2 individual and group;
- 2.3 Motivation and de -motivation;
- 2.4 Peer pressure;
- 2.4 'Culture' issues;
- 2.5 Team working;
- 2.6 Management,
- 2.7 supervision
- 2.8 leadership.

#### UNIT III: Factors Affecting Performance

- 3.1 Fitness/health;
- 3.2 Stress: domestic and work related;

- 3.3 Time pressure and deadlines;
- 3.4 Workload;
- 3.5 Overload and under load;
- 3.6 Sleep and fatigue ,
- 3.7 shift work;
- 3.8 Alcohol, medication, drug abuse.
- 3.9 Factor affecting combustion chamber performance

#### **UNIT IV: Physical Environment and Tasks**

- 4.1 Noise and fumes;
- 4.2 Illumination;
- 4.3 Climate and temperature;
- 4.4 Motion and vibration;
- 4.5 Working environment.
- 4.6 Physical work;
- 4.7 Repetitive tasks;
- 4.8 Visual inspection;
- 4.9 Complex systems.

#### **UNIT V: Communication**

- 5.1 Within and between teams;
- 5.2 Work logging and recording;
- 5.3 Keeping up to date, currency;
- 5.4 Dissemination of information.

#### **UNIT VI: Human Error and Hazards in the Workplace**

- 6.1 Error models and theories;
- 6.2 Types of error in maintenance tasks;
- 6.3 Implications of errors (i.e accidents)
- 6.4 Avoiding and managing errors.
- 6.5 Recognising and avoiding hazards;
- 6.6 Dealing with emergencies

#### **TEXT BOOKS AND REFERENCES**

1. A & P Technician power Plant, Jeppesen, FAA
2. Airframe & Power Plant Mechanics, FAA FAA
- 3 Aircraft Gas Turbine Engine, Treager, McGraw Hill, India
- 4 Jet Engine, Rolls RoyceM Rolls Royce

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

## TH.3. Aircraft inspection, maintenance and repair

Theory: 4 periods per week  
Examination: 3 hours

I.A : 20  
TOTAL MARKS : 100 Marks

### Topic-wise distribution of periods

| S.L. No. | TOPICS   | PERIODS |
|----------|--|---------|
| I        | INTRODUCTION OF TYPES OF AIRCRAFT INSPECTION AND DOCUMENTATION                   | 8       |
| II       | AIR CONDITIONING, PRESSURISATION, EQUIPMENT AND FURNISHINGS                      | 8       |
| III      | FIRE DETECTION & EXTINGUISHING SYSTEM, ICE & RAIN PROTECTION SYSTEM              | 8       |
| IV       | INSPECTION OF AIRCRAFT SYSTEMS   | 10      |
| V        | INSPECTION OF AIRCRAFT STRUCTURES, AIRCRAFT POWER PLANTS and LANDING GEAR SYSTEM | 12      |
| VI       | TOWING, MOORING, WEIGHING AND LEVELLING OF AIRCRAFT                              | 6       |

### Rationale

To make the students to understand the Airframe components and the tools used to maintain the components. Defect investigation, methods to carry out investigation and the detailed maintenance and practice procedures.

### Course Objective

- To understand the types of aircraft inspection and documentation
- To understand inspection procedures in air conditioning, pressurisation, equipment and furnishings
- To understand inspection procedures in fire detection & extinguishing system, ice & rain protection system
- To understand inspection procedures in different aircraft systems.
- To understand inspection procedures in aircraft structures, aircraft power plants and landing gear system
- To understand the concepts of towing, mooring, levelling and weighing of aircraft and its corresponding procedures

### UNIT I: INTRODUCTION OF TYPES OF AIRCRAFT INSPECTION AND DOCUMENTATION

- 1.1 Importance & purpose of aircraft inspection & Documentation
- 1.2 Inspection of aircraft for heavy landing- Tyres, landing gear equipment
- 1.3 Bird strikes: Extent of damage, assessment of repairs to be done
- 1.4 Familiarization with aircraft documents ATA100 Specifications
- 1.5 Lay out and contents of aircraft maintenance manual,
  - 1.5.1 Structural repair manual,
  - 1.5.2 Illustrated parts catalogue,
  - 1.5.3 Airworthiness directive, service bulletins,
  - 1.5.4 Maintenance planning documents /inspection schedule.
- 1.6 Entries to be made in aircraft log book: change of parts, fuel/ oil replenishment

### UNIT II: AIR CONDITIONING, PRESSURISATION, EQUIPMENT AND FURNISHINGS

- 2.1 Air conditioning and pressurization
  - 2.1.1 Discussion on importance and purpose
  - 2.1.2 Inspection of structure in Air-conditioning bay
  - 2.1.3 Installation of air-conditioning components
  - 2.1.4 Security of air-conditioning components
  - 2.1.5 Pneumatic leak check
  - 2.1.6 Oil level check for ACM
  - 2.1.7 Compressor Freon gas level check
- 2.2 EQUIPMENT AND FURNISHINGS

- 2.2.1 Basic inspection of equipment and furnishing
- 2.2.2 Installation of passenger and crew seats, safety harness
- 2.2.2 Operational check and inspection of life jacket and life raft
- 2.2.4 Inspection of fire bottle and portable oxygen bottle in the cabin
- 2.2.5 Presence of emergency equipment

### **UNIT III: FIRE DETECTION & EXTINGUISHING SYSTEM, ICE & RAIN PROTECTION SYSTEM**

#### **3.1 FIRE DETECTION & EXTINGUISHING SYSTEM**

- 3.1.1 Fire detection and extinguishing system importance and purpose
  - 3.1.2 Inspection of fire and smoke detection components,
  - 3.1.3 Inspection of fire extinguishing system components for condition and Security
  - 3.1.3 Types of fire: Explanation on solid liquid & gaseous fire purpose and uses of ground fire extinguishers and extinguishing agents.
  - 3.1.5 Aircraft fire extinguisher with typical markings
- #### **3.2 ICE & RAIN PROTECTION SYSTEM**
- 3.2.1 Ice and Rain protection - Importance of inspection
  - 3.2.2 Inspection of components of pneumatic de-icing system
  - 3.2.3 Inspection of thermal de-icing system
  - 3.2.3 Inspection of wind screen de-icing system
  - 3.2.5 Inspection of anti icing system
  - 3.2.3 Ice detection system for condition and security

### **UNIT IV: INSPECTION OF AIRCRAFT SYSTEMS**

#### **4.1 FLIGHT CONTROL SYSTEMS**

- 4.1.1 Flight control system – Importance and purpose
- 4.1.2 Inspection of :
  - 4.1.2.1 Control cables for wear
  - 4.1.2.2 Linkages for correct sense of operation
  - 4.1.2.3 Play due to wear
  - 4.1.2.4 Condition of control surfaces for de-lamination and damage, travel and neutral portion check of control surfaces.

#### **4.2 AIRCRAFT FUEL SYSTEM**

- 4.2.1 Aircraft fuel system – Introduction & importance of inspection and types of fuel
- 4.2.2 Precaution during Aircraft fuelling and defueling
- 4.2.3 Inspection of fuel leak
- 4.2.4 Aircraft fuel tank contamination check
- 4.2.4 Inspection of filters for contaminations
- 4.2.6 External inspection of fuel system
- 4.2.7 Fire hazard, static electricity and its effect

#### **4.3 HYDRAULIC SYSTEM**

- 4.3.1 Importance of Hydraulic system inspection.
- 4.3.2 Inspection of condition of hydraulic lines
- 5.3.3 Internal leak check of hydraulic components
- 4.3.4 Flow rate check
- 4.3.4 Precaution while servicing of hydraulic system

#### **4.4 AIRCRAFT OXYGEN SYSTEM**

- 4.4.1 Inspection of components and pipe lines for conditions and security
- 4.4.2 Leak check of oxygen system
- 4.4.3 Precaution to be observed while working with oxygen system

### **UNIT V: INSPECTION OF AIRCRAFT STRUCTURES, AIRCRAFT POWER PLANTS and LANDING GEAR SYSTEM**

#### **5.1 Inspection of**

- 5.1.1 Nacelles / pylon attachment fittings, fillets/fairings
- 5.1.2 stabilizers (Vertical, Horizontal) for condition & Security
- 5.1.3 windows for crazing chips and cracks
- 5.1.4 static dischargers
- 5.1.5 doors for condition, security and doors warning system



## 5.2 Inspection of

5.2.1 Ignition system components for condition and functional check

5.2.2 thrust reverser system for leak

5.2.3 oil system for leak, component chip detector and filter check

5.3 Functional check of engine indication instruments

5.4 Power supply equipment -electric, pneumatic, air starting, air-conditioning, and hitting units

5.5 Precaution while servicing of aircraft oil system

5.6 Landing gear system – Importance of inspection

5.7 Inspection of

5.7.1 landing gear system components for condition and Security

5.7.2 Inspection of structures in the wheel well area

5.7.3 Pressure Vs Extension of shock strut

5.7.4 Wheel brakes for wear and over heat condition

5.7.5 Tyres for condition and wear, correct pressure inspections.

5.8 Consequences of over inflation and under inflation of aircraft landing gear type

## **UNIT VI: TOWING, MOORING, WEIGHING AND LEVELLING OF AIRCRAFT**

6.1 Procedures following during towing, mooring , weighing and levelling of aircraft

### **TEXT BOOKS AND REFERENCES**

1. Michael J Kroes , William A Watkins , Frank Delp , Ronald Sterkenburg “Aircraft Maintenance and Repair”, Seventh Edition, 1 Jun 2013
2. FAA ‘S “ Aviation Maintenance Technician’s Handbook” (AC-65-9A)
3. FAA’S “ Civil Aircraft Inspection Procedure” CAIP-459 VOL-II

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

Elective -

1. Civil Aircraft Regulation
2. Aircraft Avionics

# Elective 1.Civil Aircraft Regulations

Theory: 4 periods per week  
Examination: 3 hours

I.A : 20 Marks  
TOTAL MARKS : 100 Marks

## Topic-wise distribution of periods

| S.L. No. | TOPICS  | PERIODS |
|----------|---|---------|
| I        | Introduction, responsibility of operators/owners, procedure for issue of CAR  | 8       |
| II       | Preparation and use of cockpit and emergency check list, minimum equipment list(MEL),defect recording/reporting/investigation   | 8       |
| III      | Flight report, maintenance control by reliability method, aircraft maintenance programme and their approval, on condition maintenance of 'reciprocating engines                     | 10      |
| IV       | Flight report, maintenance control by reliability method, aircraft maintenance programme and their approval, on condition maintenance of 'reciprocating engines                     | 8       |
| V        | Issue/re validation of type certificate of aircraft, issue /validation and renewal of certificate of airworthiness, control system -duplicate inspection, approval of flight manual | 10      |
| VI       | Age of aircraft to be imported, mandatory modification (inspection), Extended twin engine operations, flight testing of aircraft, aircraft log books                                | 8       |

## Rationale

To make the students to familiar with the Aircraft Regulations and the uses in Aerospace industries.

## Course OBJECTIVE

.To understand the responsibility of operators/owners and procedure for issue of CAR

To understand how MEL and cockpit and emergency check list are prepared

To understand Flight reporting ,maintenance control by reliability method, aircraft maintenance programme and their approval

To understand Fixing of routine maintenance periods-TBO, approval of organizations/operators, registration/de-registration of aircraft

To understand the Issue/re validation of type certificate of aircraft, issue /validation and renewal of certificate of airworthiness, control system -duplicate inspection, approval of flight manual

To understand the Age of aircraft to be imported, mandatory modification (inspection), extended twin engine operations, flight testing of aircraft, aircraft log books of aircraft

## COURSE CONTENT:

### UNITI: Introduction, responsibility of operators/owners, procedure for issue of CAR 8 Hrs

#### 1.1 Introduction

1.1.1 Brief history OF ICAO, DGCA, FAA, JAA etc.,

1.1.2 Aircraft Act 1934: Purpose and relevance

1.1.3 Aircraft Act 1034: Important Rule No's

#### 1.2 Responsibility of operators/owners

1.2.1 Background

1.2.2 Scope of responsibility

1.2.3 Scope of supervision by Airworthiness Directorate (Ref: CAR Sec 2: Series A Part I)

- 1.3 Procedure for issue of car
- 1.3.1) Scope
- 1.3.2) Promulgation of CAR
- 1.3.3) Numbering of CAR
- 1.3.4) Procedure for issue and subsequent revisions

**UNIT II: Preparation and use of cockpit and emergency check list, minimum equipment list(MEL), defect recording/reporting/investigation 8Hrs**

- 2.1 Preparation and use of cockpit and emergency check list
  - 2.1.1 Purpose and definition
  - 2.1.2 Scope (Ref CAR Sec 2 series B-II)
- 2.2 Minimum equipment list (mel)
  - 2.2.1) Applicability
  - 2.2.2) Operators MEL
  - 2.2.3 Framing of MEL
  - 2.2.4) Use of MEL (Ref CAR Section 2: Series B-I)
- 2.3 Defect recording/reporting/investigation
  - 2.3.1 Definitions
  - 2.3.2 Procedure for defect recording, reporting rectification and analysis
  - 2.3.3 Initial Information
  - 2.3.4 Review of defects
  - 2.3.5 Report monitoring
  - 2.3.6 Classification of defects (Ref CAR Sec: 2 series C-I)

**UNIT III: Flight report, maintenance control by reliability method, aircraft maintenance programme and their approval, on condition maintenance of 'reciprocating engines 10Hrs**

- 3.1 Flight report
  - 3.1.1 Purpose
  - 3.1.2 Procedure (Ref CAR Sec2: Series C-II)
- 3.2 Maintenance control by reliability method
  - 3.2.1 Purpose and applicability
  - 3.2.2 Details of program and functioning
  - 3.2.3 Sources of Information
  - 3.2.4 Information analysis and remedial measures
  - 3.2.5 Establishing alert values
  - 3.2.6 Reliability displays
  - 3.2.7 Changes in MCR method (Ref CAR Sec 2: Series C part V)
- 3.3 Aircraft maintenance programme and their approval
  - 3.3.1 Definitions
  - 3.3.2 Purpose
  - 3.3.3 Primary maintenance process
  - 3.3.4 Approval of the system
  - 3.3.5 Monitoring
  - 3.3.6 Statistical reliability method
  - 3.3.7 Explanation of hidden functions (Ref: CAR Sec 2 Series D-II)
- 3.4 ON condition maintenance of 'reciprocating engines'
  - 3.4.1 Background and scope
  - 3.4.2 Procedure (Ref CAR Sec 2, Series D-III)

**UNIT IV: Flight report, maintenance control by reliability method, aircraft maintenance programme and their approval, on condition maintenance of 'reciprocating engines 8Hrs**

- 4.1 Fixing of routine maintenance periods-tbo
  - 4.1.1) Applicability
  - 4.1.2) Fixation of initial period
  - 4.1.3) Revision of initial period s(Ref CAR Sec 2: Series D-VI)
- 4.2 Approval of organizations/operators
  - 4.2.1) Introduction
  - 4.2.2) Applicability

- 4.2.3) Procedure
- 4.2.4) Facility requirements
- 4.2.5) Manual requirements
- 4.2.6) Aircraft maintenance procedure
- 4.2.7) Approval in different categories (Ref CAR Sec 2: Series E)
- 4.2.8) CAR-145-Introduction and applicability
- 4.3 Registration/derecognizing of aircraft
  - 4.3.1) Procedure relating to registration/derecognizing of aircraft
  - 4.3.2) Introduction
  - 4.3.3) Definitions
  - 4.3.4) Change of ownership
  - 4.3.5) Aircraft imported by Air
  - 4.3.6) Registration certificate and validity
  - 4.3.7) Location of nationality or common mark and registration
  - 4.3.8) Measurement of Nationality and registration marks (Ref: CAR Sec F Part I)

**UNIT V: issue/re validation of type certificate of aircraft, issue /validation and renewal of certificate of airworthiness, control system -duplicate inspection, approval of flight manual 10 Hrs**

- 5.1 Issue/re validation of type certificate of aircraft:
  - 5.1.1 Applicability
  - 5.1.2 requirement for issue of type certificate
  - 5.1.3 requirement for re validation of type certificate (Ref: CAR section II F pt 2)
- 5.2 Issue /validation and renewal of certificate of airworthiness:
  - 5.2.1 Introduction
  - 5.2.2 Issuance of C of A
  - 5.2.3 Validity of C of A
  - 5.2.4 renewal of C of A
  - 5.2.5 Short term of C of A
  - 5.2.6 suspension of C of A (Ref: CAR section II F pt 3)
- 5.3 Control system -duplicate inspection
  - 5.3.1 Applicability
  - 5.3.2 Definition
  - 5.3.3 Procedure (Ref: CAR section II F pt xi)
- 5.4 Approval of flight manual
  - 5.4.1 Definition
  - 5.4.2 Applicability
  - 5.4.3 Format of flight manual (Ref: CAR section II F pt xvi)

**UNIT VI: Age of aircraft to be imported, mandatory modification (inspection), Extended twin engine operations, flight testing of aircraft, aircraft log books 8Hrs**

- 6.1 Age of aircraft to be imported
  - 6.1.1 Introduction
  - 6.1.2 Background
  - 6.2.3 Applicability (Ref: CAR section II F pt xx)
- 6.2 Mandatory modification (inspection)
  - 6.2.1 Applicability
  - 6.2.2 Purpose
  - 6.2.3 Definition
  - 6.2.4 Procedure ( Ref : CAR section II F pt I)
- 6.3 Extended twin engine operations
  - 6.3.1 Introduction
  - 6.3.2 Applicability
  - 6.3.3 Definition
  - 6.3.4 Procedure
  - 6.3.5 ETOPS categories
  - 6.3.6 Propulsion system monitoring (Ref: CAR section II o pt 8)
- 6.4 Flight testing of aircraft
  - 6.4.1 Applicability

- 6.4.2 Definition
- 6.4.3 Circumstances necessitating flight testing
- 6.4.4 Procedure during flight testing
- 6.4.5 Flight test report (Ref: CAR section II T pt 2)
- 6.5 Aircraft log books
  - 6.5.1 Introduction
  - 6.5.2 Applicability
  - 6.5.3 Format of journey log book
  - 6.5.4 General requirements (Ref: CAR section II X pt VI)

**TEXT BOOKS**

1. Internet website: - [dgca.gov.in](http://dgca.gov.in)
2. Civil aircraft regulations, vol. I & II.

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

## Elective 2. Aircraft Avionics

Theory: 4 periods per week  
Examination: 3 hours

I.A : 20 Marks  
TOTAL MARKS : 100 Marks

### Topic-wise distribution of periods

| S.L. No. | TOPICS   | PERIODS |
|----------|--|---------|
| I        | Introduction to Communication system                                     | 12      |
| II       | Types of communication systems   | 8       |
| III      | Navigation system of an aircraft   | 12      |
| IV       | Flight data recorder, cockpit voice Recorder systems of an aircraft      | 9       |
| V        | Introduction to RADAR systems  | 8       |
| VI       | Modern developments in Avionics and Radar field and Environmental issues | 6       |

### Rationale

To enable the students to gain a thorough knowledge about the working of Avionics and Aircraft Radio systems

### Course Objectives:

- To Introduction to Communication system
- To Types of communication systems
- To Navigation system of an aircraft
- To Flight data recorder, cockpit voice Recorder systems of an aircraft
- To Introduction to RADAR systems
- To Modern developments in Avionics and Radar field and Environmental issues

### COURSE CURRICULAM

#### UNITI: Introduction to Communication system 12 Hrs

- 1.1 Radio Communication System Fundamentals –
  - 1.1.1 EM waves, medium of propagation ,
  - 1.1.2 Radio frequency spectrum, uses and limitation of R.F.bands.
- 1.2 Radio wave propagation
  - 1.2.1 ground wave, sky wave,
  - 1.2.2 radiation angle, skip distance,
  - 1.2.3 diffraction, field strength, absorption,
  - 1.2.4 Scattering, reflection, fading,
  - 1.2.5 ducting
  - 1.2.6 critical frequency,
- 1.3 Antenna Fundamentals
  - 1.3.1 Dipole, half wave dipole
  - 1.3.2 resonant & Non-resonant antenna.
  - 1.3.3 Antenna gain,
  - 1.3.4 directional power
  - 1.3.5 Antenna Loses and efficiency
  - 1.3.6 band width, beam width, band width
  - 1.3.7 polarizat Grounding of antenna
  - 1.3.8 loading of antenna
  - 1.3.9 optimum and effective
- 1.4 Explanation of requirements of the avionic systems for aircraft like various channels in radio
  - 1.4.1 communication,(surface /taxying
  - 1.4..2 air to ground/ATC

- 1.4.3 air to air
- 1.4.4 emergency radio communication
- 1.4.5 distress channel etc
- 1.4.6 their purpose and usage
- 1.4.7 the physical qualities required for withstanding the wide variation of temperature.

## **UNIT II: Types of communication systems 8Hrs**

- 2.1 Very High Frequency(VHF)
  - 2.1.1 High Frequency(HF)
  - 2.1.2 Ultra High Frequency(UHF),
- 2.2..1 Satellite communication(SATCOM)
- 2.2.2 Intercom for pilots and the crew
- 2.2.3 Public address System(PA system) for air crew to passengers
- 2.3 VHF, HF, UHF Systems
  - 2.3.1 used ,their merits, demerits:
  - 2.3.2 Basic block level explanation for working of VHF, HF, UHF communication systems used In air craft, 2.3.3 their frequency bands, limitations.
- 2.4.Aircraft PA systems
  - 2.4.1 intercom and Passenger entertainment systems:
  - 2.4.2 Brief explanations of block level PA
  - 2.4.3 system, intercom and passenger entertainment system

## **UNIT III: Navigation system of an aircraft 12Hrs**

- 3.1 Navigation
  - 3.1.1 Basic need for navigation
  - 3.1.2 terms of safe route,
  - 3.1.3 economy, shortest possible.
- 3.2 Automatic Direction Finder and Very High Frequency Omni Range
  - 3.2.1 Block level explanation of working of Automatic Direction Finder(ADF)
  - 3.2.2 its merits, demerits.
  - 3.2.3 Block level explanation of working of Very High Frequency Omni Range(VOR)
  - 3.2.4 Equipment used for aircraft navigation
  - 3.2.5 its merits, demerits.
- 3.3. Instrument Landing System(ILS),
  - 3.3.1 lock level explanation of working of Instrument Landing System(ILS)
  - 3.3.2 lay out diagram for ILS subsystems
  - 3.3.3 advantages ,disadvantages of ILS system
  - 3.3.4 purpose of ILS Navigation.
- 3.4 Micro wave Landing System(MLS)
  - 3.4.1 Brief explanation of working of Micro wave Landing System(MLS)
  - 3.4.2 its advantages over ILS
  - 3.4.3 reasons for non implementation of MLS as a replacement of ILS (With the introduction of SATCOM Navigation)
- 3.5 Brief explanation of satcom navigation using GPS, advantages of sitcom GPS navigation over other navigation systems

## **UNIT IV: Flight data recorder, cockpit voice Recorder systems of an aircraft 6Hrs**

FDR:

- 4.1 Flight data recorder (FDR)
  - 4.1.1 Brief explanation of block diagram level working of FDR
  - 4.1.2 its special construction.
  - 4.1.3 List of important flight parameters which are recorded in FDR
  - 4.1.4 Purpose and use of FDR in training
  - 4.1.5 planning of spares
  - 4.1.6 accident investigation
  - 4.1.7 Validity of warranty etc.
  - 4.1.8 Location of FDR and reason for it
- 4.2 cockpit voice Recorder (CVR):
  - 4.2.1 Brief explanation of working of a CVR



- 4.2.2 Purpose and use of CVR in accident investigation
- 4.2.3 Air crew coordination training
- 4.2.4 location of CVR

#### **UNIT V: Introduction to RADAR systems 8 Hrs**

##### 5.1 RADAR

- 5.1.1 Explanation of basic working principles of RADAR
- 5.1.2 block diagram.
- 5.1.3 Radar range equation
- 5.1.2 statement of equation and explanation of the terms involved in Radar range equation.
- 5.1.3 Purpose and use RADAR in various fields.
- 5.1.4 Basic explanation of meaning of Primary RADAR,
- 5.1.5 Secondary RADAR,
- 5.1.6 advantages, disadvantages
- 5.1.7 Working of various types of RADARS:
- 5.1.8 Secondary surveillance ,
- 5.1.9 Doppler
- 5.1.10 INS and GPS
- 5.1.11 Brief explanation:
- 5.1.12 explanation of block diagram level working of secondary surveillance RADAR,
- 5.1.13 Purpose and areas of use.
- 5.1.14 Brief explanation of block diagram level working of Doppler navigational RADAR,
- 5.1.15 Purpose and areas of use. Brief explanation of block diagram
- 5.1.16 level working of Inertial Navigation System(INS)
- 5.1.17 Purpose and application areas for INS.
- 5.1.18 Brief explanation of working principles of satellite navigation system using GPS,
- 5.1.19 Advantages, disadvantages of GPS.

#### **UNIT VI: Modern developments in Avionics and Radar field and Environmental issues 6Hrs**

- 6.1 Development of Avionics
- 6.1.1 Understanding modern developments
- 6.1.2 New development in Avionics
- 6.1.3 New development in Radar
- 6,1,4 Understanding Environmental issues.

#### **TEXT BOOKS**

1. Modern radio communication, Kennedy
- 2 Introduction to Radar systems, Skollnik.McGrawHill,India
- 3 Principles of Avionics, Albert Helfrick

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

## **PR.1. AIRCRAFT SYSTEM LAB**

**Theory: 6 periods per week**

**Examination: 3 hours**

Rationale:

1. To familiarize the students with basic aircraft systems

**Practical/Exercise:**

1 Identification of the important systems in use of an aircraft and their function

2 Demonstration of basic-mechanical systems like push-pull rods, cable and pulley system

3 Demonstration of hydraulic and pneumatic systems

4 Aircraft "Jacking Up" procedure

5 Aircraft "Levelling" procedure

6 Control System "Rigging check" procedure

7 Aircraft "Symmetry Check" procedure

8 "Flow test" to assess of filter element clogging

9 "Pressure Test" To assess hydraulic External/Internal Leakage

10 "Pressure Test" procedure on fuel system components

## **PR.2. Aircraft Jet Engine Lab**

**Theory: 6 periods per week**

**Examination: 3 hours**

**Rationale:**

To enable students to locate, identify and demonstrate various aircraft jet engine components, and functions

**Practical/Exercise**

- 1 Explanation of Jet propulsion theory and types of Jet engine
- 2 Identification of important components of a gas turbine engine
- 3 To demonstrate the constructional arrangement and operation of turboprop and turboshaft.
- 4 Identification of Rotor Blades, Stator Blades, Vanes, Study of shape of blade & vanes
- 5 Identification of combustion chamber, different types and flow pattern
- 6 Identification of turbine, Study of shape of Turbine blades
- 7 Identification and location of Exhaust cone, Nozzle and Tail pipe
- 8 Wall pressure measurements of a subsonic diffusers
- 9 Velocity profiles of free jets
- 10 Recognition of visual defects of jet engines.

## PR.3. CAD/CAM LAB

|   |       |                           |     |
|---|-------|---------------------------|-----|
| Name of the Course: Diploma in Mechanical Engg. |       |                           |     |
| Course code:                                    |       | Semester                  | 5th |
| Total Period:                                   | 60    | Examination               | NIL |
| Theory periods:                                 | 4 P/W | Sessional:                | 50  |
| Maximum marks:                                  | 100   | End Semester Examination: | NIL |

### COURSE OBJECTIVES

Students will develop ability towards

- 1.To understand the fundamentals and use of CAD.
- 2.To conceptualize drafting and modelling in CAD.
- 3.To interpret the various features in the menu of solid modelling package.
- 4.To synthesize various parts or components in an assembly.
- 5.To prepare CNC programmes for various jobs

### COURSE CONTENTS

#### PART-A.

INTRODUCTION;

Part modelling, Datum plane, Datum plane; constraint; dimensioning; extrude; revolve; sweep; protrusion; extrusion; rib; shell; hole; round; chamfer; copy; mirror; assembly; align; orient.

**EXERCISES:**

**2D Drawings of Rectangle, circle, polygon and its dimensioning**

**3D Drawings of;**

**1.Gib and cutter joint**

**2.Screw Jack;**

**3.Connecting Rod;**

**4.Bearing Block.**

**Print the orthographic view from the above assembled 3Ddrawing**

## **PART-B.**

### CNC Programming and Machining

#### INTRODUCTION;

- 1.Study of CNC lathe, milling;
- 2.Study of international codes; G-Codes and M –Codes
- 3.Format –Dimensioning methods;
- 4.Programme writing –Turning Simulator-Milling simulator IS practice-commands menus
- 5.Editing the programme in the CNC MACHINES;
- 6.Execute the programme in the CNC machines;

#### **Exercise;**

Print the programme and make the component in the CNC machine;

- 7.Using canned cycle-create a part programme for thread cutting, grooving and produce component in the CNC Turning Machine
- 8.Using Linear interpolation and Circular Interpolation-Create a part programme for grooving and produce component in the CNC Milling Machine

## Pr-5 LIFE SKILL (Common to All Branches)

|                      |                           |                    |                 |
|----------------------|---------------------------|--------------------|-----------------|
| <b>Practical</b>     | <b>2 Periods per week</b> | <b>Sessional</b>   | <b>25 Marks</b> |
| <b>Total Periods</b> | <b>30 Periods</b>         | <b>Total Marks</b> | <b>25 Marks</b> |

**Objective:** After completion of this course the student will be able to:

- Develop team spirit i.e. concept of working in team
- Apply problem solving skills for a given situation
- Use effective presentation techniques
- Apply task management techniques for given projects
- Enhance leadership traits
- Resolve conflict by appropriate method
- Survive self in today's competitive world
- Face interview without fear

### DETAIL CONTENTS:

#### 1. SOCIAL SKILL

Society, Social Structure, Develop Sympathy and Empathy  
 Swot Analysis – Concept, How to make use of SWOT  
 Inter personal Relation: Sources of conflict, Resolution of conflict ,  
 Ways to enhance interpersonal relation

#### 2. PROBLEM SOLVING

Steps of Problem solving:

- Identify and clarify the problem,
- Information gathering related to problem,
- Evaluate the evidence,
- Consider alternative solutions and their implications,
- Choose and implement the best alternative,
- Review
- Problem solving techniques:

1) Trial and error, 2) Brain storming, 3) Lateral (Out of Box) thinking

#### 3. PRESENTATION SKILL

Body language , Dress like the audience  
 Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,  
 Voice and language – Volume, Pitch, Inflection, Speed, Pause  
 Pronunciation, Articulation, Language, Practice of speech.  
 Use of AV aids such as Laptop with LCD projector, white board etc.

#### 4. GROUP DISCUSSION AND INTERVIEW TECHNIQUES

*Group Discussion:*

Introduction to group discussion, Ways to carry out group discussion,  
 Parameters— Contact, body language, analytical and logical thinking,  
 decision making

*Interview Technique :*

Dress, Posture, Gestures, facial expression, Approach  
 Tips for handling common questions.

## 5. WORKING IN TEAM

Understand and work within the dynamics of a groups.

Tips to work effectively in teams,

Establish good rapport, interest with others and work effectively with them to meet common objectives,

Tips to provide and accept feedback in a constructive and considerate way ,

Leadership in teams, Handling frustrations in group.

## 6. TASK MANAGEMENT

Introduction, Task identification, Task planning ,  
organizing and execution, Closing the task

## PRACTICAL

**List of Assignment:** *(Any Five to be performed including Mock Interview)*

### a. SWOT analysis:-

Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT.

- a) Your past experiences,
- b) Achievements,
- c) Failures,
- d) Feedback from others etc.

### b. Solve the True life problem assigned by the Teacher.

## 3. Working in a Team

Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slum area, social activities like giving cloths to poor etc. ( One activity per group where Team work shall be exhibited)

## 4. Mock Interview

## 5. Discuss a topic in a group and prepare minutes of discussion.

## 6. Deliver a seminar for 5 minutes using presentation aids on the topic given by your teacher.

## 7. Task Management

Decide any task to be completed in a stipulated time with the help of teacher. Write a report considering various steps in task management (with Break up into sub tasks and their interdependencies and Time)

**Note:** -1. Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic.

**Note:** -2. The following Topics may be considered for Seminar/GD in addition to other Topics at the discretion of the Teacher.

(Comparison with developed countries, Occupational Safety, Health Hazard, Accident & Safety, First-Aid, Traffic Rules, Global Warming, Pollution, Environment, Labour Welfare Legislation, Labour Welfare Acts, Child Labour Issues, Gender Sensitisation ,Harassment of Women at Workplace)

## METHODOLOGY:

*The Teacher is to explain the concepts prescribed in the contents of the syllabus and then assign different Exercises under Practical to the students to perform.*

**Books Recommended:-**

| <b>Sl.No</b> | <b>Name of Authors</b> | <b>Title of the Book</b>          | <b>Name of the Publisher</b> |
|--------------|------------------------|-----------------------------------|------------------------------|
| 01           | E.H. Mc Grath , S.J    | Basic Managerial Skills for All   | PHI                          |
| 02           | Lowe and Phil          | Creativity and problem solving    | Kogan Page (I) P Ltd         |
| 03           | Adair, J               | Decision making & Problem Solving | Orient Longman               |
| 04           | Bishop , Sue           | Develop Your Assertiveness        | Kogan Page India             |
| 05           | Allen Pease            | Body Language                     | Sudha Publications Pvt. Ltd. |



## **Pr 5. PROJECT WORK (Phase-II)**

**Theory: 6 periods per week**

**Examination: 4 hours**

### **Rationale:**

Students' Project Work aims at developing innovative skills. The students apply the knowledge and their skills to develop the project work.. The prime emphasis of the project work is to understand and apply the basic knowledge of the principles of aeronautical engineering practices.

Entire Project shall spread over 5<sup>th</sup> and 6<sup>th</sup> Semester. Part of the Project covered in 5<sup>th</sup> Semester shall be named as *Project Phase-I* and balance portion to be covered in 6<sup>th</sup> Semester shall be named as *Project Phase-II*.

### **Practical/Exercise:**

Following are the broad suggestive areas of project work

- ✓ Aerodynamics based projects.
- ✓ Propulsion based projects.
- ✓ Aircraft structures based projects.
- ✓ Engine maintenance based projects
- ✓ Aircraft system based projects.
- ✓ UAV based projects
- ✓ Quad captor based projects
- ✓ VTOL based projects
- ✓ Aviation traffic based projects
- ✓ Avionics based projects

A suggestive criterion for assessing student performance by the external (preferably person from industry) and internal (teacher) examiner is given in table below:

| <b>Sl. No.</b> | <b>Performance Criteria</b>                                       |
|----------------|---|
| 1.             | Selection of project assignment                                   |
| 2.             | Planning and execution of considerations                          |
| 3.             | Quality of performance  |
| 4.             | Providing solution of the problems or production of final product |
| 5.             | Sense of responsibility   |
| 6.             | Self expression/ communication/<br>Presentation skills            |
| 7.             | Interpersonal skills/human relations                              |
| 8.             | Report writing skills   |
| 9              | Viva voce   |

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organizations to such an exhibition.

#### **Project Phase-I and Phase-II**

The Project work duration shall cover 2 semesters(5<sup>th</sup> and 6<sup>th</sup>sem). The Grouping of students, selection of Project, assignment of Project Guide to the Group shall be done in the beginning of 5<sup>th</sup>sem under Project Phase-I. The students may be allowed to study literature, any existing system and then define the Problem/objective of the Project. Preliminary work upto Design of the system have to be complete in Phase-I. Execution of work may begin in Phase-I depending on the Project. Project Milestones are to be set so that progress can be tracked . In Phase-II Execution of work and Documentation have to be complete. Project Report have to be prepared and complete in Phase-II. All Project reports should be organized uniformly in proper order, irrespective of group. Teacher Guides can make suitable alteration in the components of Task and schedule.

At the end of Project Phase-I in 5<sup>th</sup> semester there shall be one presentation by each group to mark to progress and also to judge whether the Project is moving in right direction as per the objective of the Project.

## **EQUIPMENT LIST**

### **AIRCRAFT SYSTEM LAB**

| <b>Sl.No.</b> | <b>Name of the Equipment</b>               | <b>Quantity</b> |
|---------------|--|-----------------|
| 1             | One full scale aircraft                    | 1               |
| 2             | One full scale aircraft with control stick | 1               |
| 3             | One full scale aircraft with landing gear  | 1               |
| 4             | jack up rig                                | 2               |
| 5             | Spirit Level Measuring Instrument          | 2               |
| 6             | Flow measuring clogging system             | 1               |

### **Aircraft Jet Engine Lab**

| <b>Sl.No.</b> | <b>Name of the Equipment</b>                            | <b>Quantity</b> |
|---------------|---|-----------------|
| 1             | Jet engine for demonstration                            | 1               |
| 2             | Jet facility with compressor and storage tank           | 1               |
| 3             | Multitube manometer                                     | 1               |
| 4             | subsonic diffusers and pressure measurements facilities | 1               |
| 5             | Convergent nozzle                                       | 1               |