SAVITRIBAI PHULE PUNE UNIVERSITY

SYLLABUS

M.Sc. Aviation

(FOR AFFILIATED COLLEGES)

FACULTY OF SCIENCE & TECHNOLOGY

UNDER NATIONAL EDUATION POLICY
(NEP 2020)

TO BE IMPLEMENTED FROM
ACADEMIC YEAR 2026-2027

M.Sc. Aviation Syllabus 2026-2027 (NEP 2020)

Preamble

The M.Sc. (Aviation) is a highly specialized program focused on the complex technological, economic, and regulatory challenges facing the global air transport system. It incorporates advanced theoretical instruction, specialized laboratory work, and hands-on application of cutting-edge technologies and simulation tools in areas such as Aviation Economics, Advanced Airport Operations, and Aviation Safety Management.

The systematically designed curriculum aims to motivate and encourage students to pursue doctoral research in aviation and to prepare them for leadership roles within the aviation industry and regulatory bodies.

Introduction:

As per the recommendations of the UGC and University guidelines, the postgraduate (PG) degree course in Aviation is structured as a four-semester program spread over two academic years. The Teaching-Learning Process (TLP) is student-centric, incorporating advanced theoretical instruction, intensive laboratory work, complex problem-solving, and a significant research component.

The program offers a flexible academic structure while ensuring a strong foundation and in-depth specialized knowledge in critical areas of aviation.

Significance:

In the first year of the postgraduate program (Semesters I & II), the curriculum focuses on advanced core subjects such as Aviation Economics, Airport Operations, Aviation Law, and Safety Management. It is further augmented by major elective courses with a strong emphasis on Artificial Intelligence (AI), Predictive Analytics, and Digital Twin Simulation.

The practical components are designed to develop advanced analytical skills and emphasize the implementation of data-driven solutions.

In the second year of the postgraduate program (Semesters III & IV), the focus shifts toward specialization and research. This phase includes advanced subjects aligned with industry requirements, an extensive research project or dissertation, and On-the-Job Training (OJT) to facilitate professional integration and develop independent research capabilities. The program aims to significantly enhance students' competencies to meet the growing demand for highly skilled technical and managerial professionals in the rapidly evolving aviation sector.

Eligibility Criteria:

Bachelor Degree in Aviation, Science or Engineering, you must also have studied and passed Mathematics and Physics in your 12^{th} standard.

Programme Outcomes: M.Sc. Aviation

PO1	Demonstrate comprehensive knowledge of aviation operations, management, regulations, safety, and emerging technologies.
PO2	Apply scientific and technical principles to analyze and solve aviation-related problems effectively.
PO3	Identify, assess, and manage operational risks while promoting aviation safety standards and best practices.
PO4	Interpret and comply with national and international aviation laws, regulations, and industry standards.
PO5	Conduct independent research, analyze aviation data, and develop evidence-based solutions to industry challenges.
PO6	Demonstrate leadership, decision-making, and managerial skills in aviation organizations and multidisciplinary teams.
PO7	Communicate effectively with aviation professionals, stakeholders, and the public using appropriate technical and professional practices.
PO8	Utilize modern aviation technologies, digital tools, and innovative approaches to improve operational efficiency and performance.
PO9	Uphold professional ethics, promote sustainable aviation practices, and engage in continuous learning to adapt to evolving industry needs.

Programme Specific Outcomes (PSOs)

PSO1	Apply advanced knowledge of aviation systems, airport operations, airline management, and regulatory frameworks to effectively manage aviation-related activities.
PSO2	Demonstrate competence in implementing aviation safety management systems, security procedures, and compliance with national and international aviation regulations.
PSO3	Utilize quantitative, analytical, and research-based approaches to identify, evaluate, and solve complex operational and managerial challenges in the aviation sector.
PSO4	Employ modern aviation technologies, digital tools, and sustainable practices to enhance operational efficiency and support environmentally responsible aviation development.
PSO5	Exhibit leadership, communication, teamwork, and research skills necessary for professional practice, innovation, and lifelong learning in the global aviation industry

Methods of Assessment:

Assessment for the M.Sc. program follows the same rigorous process as the undergraduate degree, adhering to the Savitribai Phule Pune University Circular no. 125, dated: 01.06.2011. End Semester Examinations (UE) is conducted as per the guidelines from SPPU, Pune.

Examination Administration:

The administration process is strictly followed:

1. The examination schedule is approved by the SPPU Examination Department and notified to students.

2. Question Paper Setter panels are prepared, verified by the internal board, and approved by the SPPU Examination Department.
3. Question papers are submitted in sets of three, with one set selected and printed under the strict vigilance of the college examination officer.

Internal Assessment (CA):
Internal Assessment (CA) is based on the student's assignments, and class test marks, and conduct seminars compiled by the concerned subject teacher.

Exam Curriculum: (One Unit Test):
College conducts two class tests/term exam in each semester and one final semester examination at the end of each semester. The schedule of each examination circulated through college notice board and/or what's app group before 15 days of examination date. College maintains all examination records in hard copy as well as soft copy.

The Overall course structure is summarized in the table below:

Courses Credits	Credits
Core Courses	
Major Core Theory	42
Major Core Practical's	30
Elective Courses	
Major Elective (Theory)	8
Major Elective (Practical's)	8
Total number of credits for award of PG degree	**88**

LEVEL 6.0 (First Year): M. Sc. Aviation Credit Frame Work

Semester I		
Subject Code	**Name of the Subject**	**Credits**
Major Core		
AV501-MJ	Principles and Modeling Aviation Science	4
AV502-MJ	Avionics Embedded Systems	4
AV503-MJ	Aircraft Structural Integrity	4
AV504-MJP	Structural Integrity Lab	2
AV541-RM	Research Methodology	4
Major Elective Theory (Any one)		
AV 510-MJ	Aviation Economics & Airport Operations	2
AV511-MJ	Aviation Organization Theory and Management	
Major Elective Practical (Any one)		
AV 512-MJP	Aviation Analytics & Airport Simulation Laboratory	2
AV 513-MJP	Aviation Organizational Dynamics & Operations Control Laboratory	
Number of credits to be completed in a Semester I		22
Semester II		
Subject Code	**Name of the Subject**	**Credits**
Major Core		
AV 551-MJ	Aircraft Maintenance Practices	4

AV 552-MJ	Aircraft Engine Performance & Health Analytics	4
AV 553-MJ	Drone Technology & UAV Systems	4
AV 554-MJP	UAS Simulation Lab	2
AV 581-OJT	On Job Training (Internship)	4
Major Elective Theory (Any one)		
AV 560-MJ	Aviation Law & Safety Management	2
AV561-MJ	Aviation Cyber Security	
Major Elective Practical (Any one)		
AV 562-MJP	Aviation Safety Informatics Lab	2
AV 563-MJP	Aviation Cyber Security Lab	
Number of credits to be completed in a Semester II		22
Total Credits of Semester I and Semester II		44
Semester III		
Subject Code	**Name of the Subject**	**Credits**
Major Core		
AV 601-MJ	Air Traffic Management Navigation	4
AV 602-MJ	Aviation Reliability Logistics Support	4
AV 603-MJ	Flight Simulation & Aircraft Digital Twins	4
AV 604-MJP	Flight Simulation & Flight Data Analytics Lab	2
AV 631-RP	Research Project	4
Major Elective Theory (Any one)		
AV 610-MJ	Aviation Accident Investigation and Analysis	2
AV611-MJ	Aviation Prognostics & System Health Management	
Major Elective Practical (Any one)		
AV 612-MJP	Aviation Accident Analysis Lab	2
AV 613-MJP	Aviation Health Analytics Lab	
Number of credits to be completed in a Semester III		22

Semester IV		
Subject Code	**Name of the Subject**	**Credits**
Major Core		
AV 616 MJP	Actual Environment Training (AET)/ Original Equipment Manufacturer (OEM)	16
AV 617RP	Research Project	6
Number of credits to be completed in a Semester IV		22
Total Credits of Semester I and Semester II		44
Total Credits of Semester I, II, III and IV		88

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

M. Sc. [Part- I] (Aviation)

Major Core Compulsory Theory Course

Semester I: AV501 MJ: Principles and Modeling Aviation Science

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
4	4 Lectures/ Week	60	30 Marks	70 Marks

Course Objectives:

CO1	To explain fundamental aerodynamic principles, flight forces, and aircraft structural components.
CO2	To detail the operations of aircraft auxiliary systems and gas turbine propulsion engines.
CO3	To introduce air navigation methodologies, instrument usage, and air traffic management procedures.
CO4	To familiarize students with national/international aviation regulations, laws, and Safety Management Systems (SMS).
CO5	To analyze the impact of human factors and error mitigation strategies in aviation operations.

Course Outcomes:

CO1	Explain aerodynamic forces, airflow behavior, and the functions of primary aircraft structures.
CO2	Analyze the performance and mechanics of various propulsion systems and auxiliary components.
CO3	Interpret navigation charts, systems, and ATC procedures for efficient flight operations.
CO4	Apply DGCA/ICAO regulatory standards and the core pillars of safety management.
CO5	Evaluate human performance limitations and implement effective error mitigation strategies.

Unit 1: Introduction to Aviation & Aerodynamics

- **Introduction to Aviation:** History of aviation, the structure of the global and domestic aviation industry, and key stakeholders.
- **Aerodynamics:** Four forces of flight (lift, weight, thrust, drag), principles of airflow, boundary layers, and the function of control surfaces.
- **Aircraft Structures:** Over view of the primary structural components: fuselage, wings, empennage, and landing gear**.**

Unit II: Aircraft Systems & Propulsion

- **Aircraft Systems:** Principles and operation of hydraulic and pneumatic systems, anti-icing systems, and fire protection systems.
- **Propulsion:** Introduction to different types of aircraft engines, including turbo jet, turbo fan, and turboprop engines, and how they generate thrust.
- **Engine Components:** The function of key components such as the inlet, compressor, combustor, turbine, and nozzle.

Unit III: Navigation & Flight Operations

- **Air Navigation:** Principles of navigation, including the use of navigation

instruments, charts, and maps.

- **Navigation Methods:** An over view of different methods, including radio navigation and satellite navigation systems (GPS).
- **Air Traffic Management (ATM):** The role of Air Traffic Control (ATC), air space classification, and the procedures for managing safe and efficient air traffic flow.

Unit IV: Aviation Safety & Regulations

- **Aviation Regulations:** Study of national and international regulatory bodies like the Directorate General of Civil Aviation (DGCA) and the International Civil Aviation Organization (ICAO).
- **Aviation Law:** Introduction to key international conventions that govern international air law.
- **Aviation Safety:** Principles of a Safety Management System (SMS) and the four pillars of safety management.
- **Human Factors:** The study of human performance and limitations causes of human error and strategies for error mitigation in aviation.

Reference Books

Sl. No.	Author / Publisher	Nomenclature of Book
1	Suzanne K. Kearns	Fundamentals of International Aviation
2	Gert Meijer	Fundamentals of Aviation Operations
3	Michael Kroes, Michael S. Nolan	Aircraft Basic Science
4	Gert Meijer	Fundamentals of Aviation Operations
5		DGCA Civil Aviation Requirements (CAR) Manual

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Core Compulsory Theory Course
Semester I: AV502 MJ: Avionics & Embedded Systems

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
4	4 Lectures/ Week	60	30 Marks	70 Marks

Course Objectives:

CO1	To teach circuit fundamentals, digital logic, microprocessors, and aircraft data buses.
CO2	To explain aircraft power generation, distribution networks, and electronic flight displays.
CO3	To detail aircraft communication, navigation (VOR/ILS/GPS), and autopilot control systems.
CO4	To introduce aviation embedded programming and hardware-software system design.
CO5	To outline modern avionics trends including IMA, advanced sensors, and AI.

Course Outcomes:

CO1	Analyze digital logic circuits and microprocessor architectures used in aircraft.
CO2	Evaluate electrical power distribution safety and data presentation on flight displays.
CO3	Explain communication links, navigation aids, and automatic flight control mechanics.
CO4	Program and troubleshoot basic embedded systems regulating hardware interactions.
CO5	Assess next-generation advancements like Integrated Modular Avionics (IMA) and AI.

Unit 1: Fundamentals of Electronics & Digital Systems

- **Electronics Fundamentals**: Basic principles of DC and AC circuits, including resistance, inductance, and capacitance. The function of transformers, generators, and electric motors is also covered.
- **Digital Techniques:** This includes a study of number systems, logic circuits, and data conversion. Students will also learn the basic structure of a computer, microprocessors, and data buses, which are crucial for embedded systems in aircraft**.**

Unit 2: Aircraft Electrical & Instrumentation Systems

- **Electrical Power**: Topics include the generation, distribution, and protection of electrical power on an aircraft. The functions of batteries and circuit breakers are also covered.
- **Electronic Instrument Systems**: Students get an overview of electronic flight displays and how they present data to the pilot. The syllabus also introduces the use of fibre optics in modern aircraft systems.

Unit 3: Avionics Systems & Integration

- **Communication & Navigation**: This covers the principles of communication systems (radio, intercom, and data link systems) and various navigation systems such as VOR, ILS, and GPS.
- **Flight Control Systems**: An introduction to the principles of automatic flight control and the components of an autopilot system is included.

Unit 4: Embedded Systems in Aviation & Modern Trends

- **Embedded Systems**: Students learn about the role of embedded systems in various aircraft functions, from engine control to environmental systems. The unit covers basic programming concepts and hardware-software interaction.
- **Modern Trends:** This provides an overview of current and future technologies in avionics, such as artificial intelligence, integrated modular avionics (IMA), and advanced sensor systems.

Reference Books

Sl.No.	Author/Publisher	Nomenclature of Book
1	Chattopadhyay, Santanu	Embedded System Design
2	Ian Moir	Civil Avionics Systems
3	R.P.G. Collinson	Introduction to Avionics Systems
4	Aircraft Systems	Ian Moir, Allan Seabridge
5	Cary R. Spitzer	Avionics Elements, Software and Functions

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Core Compulsory Theory Course
Semester I: AV503 MJ: Aircraft Structural Integrity

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
4	4 Lectures/ Week	60	30 Marks	70 Marks

Course Objectives:

CO1	To analyze aircraft flight loading conditions, V-n diagrams, and structural mechanics.
CO2	To evaluate fatigue limits, variable stress spectrums, and structural life consumption.
CO3	To apply fracture mechanics principles, toughness criteria, and crack growth modeling.
CO4	To determine buckling boundaries in structural columns and thin-skinned panels.
CO5	To contrast safe-life, fail-safe, and damage-tolerance structural design philosophies.

Course Outcomes:

CO1	Compute design safety factors and shear flow distribution across thin-walled sections.
CO2	Estimate fatigue damage accumulation utilizing Rainflow counting and Miner's rule.
CO3	Predict cyclic fatigue crack propagation rates using Paris' Law equations.
CO4	Calculate critical elastic buckling limits for structural plates and struts.
CO5	Establish safety inspection intervals based on modern damage tolerance criteria.

Unit 1: Loads & Structural Mechanics Flight Loads: Maneuver and gust loads, V-n diagrams, and design safety factors. Mechanics & Sections: Principal Stresses, aluminum yield criteria, and thin-walled shear flow. Panels: Structural load-sharing between skin, stringers, and longerons.

Unit 2: **Fatigue & Life Estimation Fatigue Basics**: High/low-cycle fatigue, S-N curves, and mean stress corrections. Spectrum Analysis: Variable-amplitude stress tracking and Rainflow cycle counting. Life Prediction: Linear damage tracking using Palmgren-Miner's rule.

Unit 3: **Fracture Mechanics (LEFM)Crack Behavior**: Stress concentrations, deformation modes, and crack-tip stress fields. Toughness: Stress Intensity Factors (k), critical toughness (k_{1c}), and material selection. Growth Modeling: Stable fatigue crack propagation tracking using Paris' Law.

Unit 4: **Instability & Design Philosophies Buckling**: Euler column limits, slenderness ratios, and thin fuselage skin buckling. Classic Design: Safe-Life versus Fail-Safe structural redundancy principles. Modern Design: Damage Tolerance criteria and structural inspection interval planning.

Reference Books

Sl.No.	Author/Publisher	Nomenclature of Book
1	T.H.G. Megson	Aircraft Structures for Engineering Students
2	David Broek	Elementary Engineering Fracture Mechanics
3	E.F. Bruhn	Analysis and Design of Flight Vehicle Structures

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Core Compulsory Practical Course
Semester I: AV504 MJP: Structural Integrity Lab

Credits	Teaching Hours	Total Practices	Continuous Internal Assessment	End Semester Examination
2	4 Lectures/ Week	15	15 Marks	35 Marks

Course Objectives:

CO1	To generate V-n flight envelopes and calculate shear flow distributions across thin-walled wing spars.
CO2	To plot principal stress fields and determine material failure limits using Von Mises yield boundaries.
CO3	To perform analytical S-N curve fitting with mean stress corrections and apply Rainflow counting to irregular flight logs.
CO4	To compute structural life consumption using Palmgren-Miner linear damage accumulation calculators and model Paris' Law crack growth.
CO5	To solve column or plate buckling elastic boundaries and apply digital filters to piezoelectric crack detection signals.

Experiments: (Any 6 out of 10)

1. To generate and study the V-n diagram for different aircraft flight envelopes.
2. To calculate and analyze the shear flow distribution in a thin-walled wing spar.
3. To plot and determine the principal stresses and Von Mises yield boundary for a component.
4. To fit an S-N curve using fatigue data and apply mean stress corrections.
5. To implement the Rainflow Counting Algorithm to analyze irregular flight loading data.
6. To calculate total structural fatigue damage using the Palmgren-Miner linear rule.
7. To simulate and analyze the stress intensity factor near an aircraft crack tip.
8. To predict fatigue crack growth and total life of an aerospace alloy using Paris' Law.
9. To solve and plot the buckling boundaries for aircraft columns and thin plates.
10. To filter piezoelectric sensor signals to detect cracks in structural components.

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Core Compulsory Theory Course
Semester I: AV541 RM: Research Methodology

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
4	4 Lectures/ Week	60	30 Marks	70 Marks

Course Objectives:

CO1	To teach the fundamental steps and concepts of scientific research.
CO2	To explain different quantitative and qualitative research methods.
CO3	To introduce statistical techniques for analyzing research data.
CO4	To guide students in drafting structured research proposals and reports.
CO5	To train students in professional research presentation techniques.

Course Outcomes:

CO1	At the end of this course, students should be able to:
CO2	Explain the foundational concepts and steps of the research process.
CO3	Choose the right research design and method to solve a problem.
CO4	Apply statistical tools to analyze and validate experimental data.
CO5	Write clear, professional research reports and grant proposals.

Unit 1: Foundations of Research

- **Introduction to Research**: The meaning, objectives, and importance of research in the context of the aviation industry. It would also cover different types of research, such as fundamental, applied, descriptive, and experimental research.
- **Scientific Inquiry**: An overview of the scientific method, including the concepts of theory, hypothesis formulation, and variables.
- **Problem Formulation**: Techniques for identifying a research problem and formulating a clear research question and hypothesis.

Unit 2: Research Design & Data Collection

- **Research Design:** The concept and importance of a good research design, including exploratory, descriptive, and experimental designs.
- **Data Collection Methods**: An exploration of various data collection methods, including both primary and secondary data. It would also cover the design of questionnaires and the use of observation and interviews for collecting data.
- **Sampling:** This section would covert the principles of sampling design, including different types of sampling procedures and methods for determining an appropriate sample size.

Unit 3: Data Analysis & Interpretation

- **Qualitative vs. Quantitative Analysis:** A comparative study of qualitative and quantitative data analysis methods.
- **Statistical Techniques**: An introduction to both descriptive and inferential statistics including measures of central tendency, dispersion, correlation, and regression. The

unit would also cover statistical tests like t-tests, ANOVA, and Chi-square tests.

- **Using Software for Analysis:** Practical sessions using statistical software (e.g. RSPSS) for data processing and analysis.

Unit 4: Research Ethics & Report Writing

- **Research Ethics:** An overview of ethical considerations in research, including data integrity, plagiarism, and intellectual property rights (IPR).
- **Report Writing:** Principles of effective scientific communication, including structuring research report, preparing a dissertation, and presenting findings in seminars.

Reference Books

Sl.No.	Author/Publisher	Nomenclature of Book
1	C.R. Kothari	Research Methodology: Methods and Techniques
2	Engwa Azeh Godwill	Fundamentals of Research Methodology
3	BILLTAYLOR	Research Methodology

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

M. Sc. [Part- I] (Aviation)

Major Elective Theory Course

Semester I: AV510 MJ: Aviation Economics & Airport Operations

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
2	2 Lectures/ Week	30	15 Marks	35 Marks

Course Objectives:

CO1	To teach airline market demand, operating costs, yield management, and carrier business models.
CO2	To explain airfield layout engineering, airside management, and ground handling ramp services.
CO3	To outline passenger terminal flow, baggage systems handling, and operational performance KPIs.
CO4	To distinguish between aeronautical and non-aeronautical revenues under privatization (PPP) frameworks.
CO5	To review governance rules (ICAO/IATA/DGCA), airport slot allocations, and regional economic impacts.

Course Outcomes:

CO1	Analyze airline cost structures, dynamic pricing strategies, and carrier business performance.
CO2	Optimize airside ground handling operations; aircraft stand allocations, and airfield layout traffic.
CO3	Evaluate passenger terminal flow bottlenecks, baggage networks, and waiting time KPIs.
CO4	Formulate financial strategies balancing aeronautical revenue streams with commercial retail leases.
CO5	Apply regulatory slot allocation guidelines and assess the regional economic impact of airports.

Unit 1: Airline Economics & Pricing Airline Costs: Understanding Direct Operating Costs (fuel, crew, maintenance) vs. Indirect Operating Costs. Pricing & Revenue: Basics of dynamic airfare pricing and passenger seat inventory management. Business Models: Core operational differences between Full-Service Carriers (FSCs) and Low-Cost Carriers (LCCs).

Unit 2: **Airside & Ramp Operations Airport Layout:** Basic configurations of runways, taxiways, aprons, and holding bays. Airside Safety: Essentials of runway markings, airfield lighting, and aircraft stand allocation. Ground Handling: Turnaround procedures, including aircraft fueling, pushback, and baggage loading.

Unit 3: **Terminal Operations & Passenger Flow Passenger Processing**: Step-by-step terminal flow: check-in, security screening, and boarding gates. Baggage Handling: Basic mechanics of outbound sorting networks and inbound arrival carousels. Performance Metrics: Measuring passenger waiting times, queue bottlenecks, and space efficiency.

Unit 4: **Airport Revenue & Governance Aeronautical Revenue**: Income from landing fees,

aircraft parking, and passenger service charges. Non-Aeronautical Revenue: Commercial income from retail leases, duty-free shops, and car parking. Aviation Governance: Role of key regulatory bodies (ICAO, IATA, DGCA) and basic rules for flight slot allocation.

Reference Books

Sl. No.	Author/Publisher	Nomenclature of Book
1	Norman J. Ashford, et al.	Airport Engineering: Planning, Design, and Development
2	Rieberry (or Airport Management – C. Daniel Prather)	Airline Airport Management
3	George W. James	Airline Economics
4		Airport Operation Manual

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

M. Sc. [Part- I] (Aviation)

Major Elective Theory Course

Semester I: AV511 MJ: Aviation Organization Theory and Management

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
2	2 Lectures/ Week	30	15 Marks	35 Marks

Course Objectives:

CO1	To explain organizational structures, stakeholder networks, and ecosystem dependencies in aviation.
CO2	To teach strategic fleet planning, crisis resilience frameworks, and change management models.
CO3	To introduce proactive Safety Management Systems (SMS), Just Culture, and Crew Resource Management.
CO4	To detail aviation quality audit standards, Lean turnaround optimization, and aerospace supply chains.
CO5	To review ICAO/IATA global governance, state authority oversight, and sustainability mandates.

Course Outcomes:

CO1	Analyze matrix and functional organizational designs across airlines, airports, and regulatory bodies.
CO2	Formulate fleet expansion plans and crisis management strategies for macro-level market disruptions.
CO3	Implement non-punitive safety reporting systems and risk mitigation workflows within an SMS.
CO4	Optimize aircraft turnaround processes using Lean methods and evaluate global quality audits.
CO5	Audit corporate operations for compliance with ICAO standards, national rules, and green mandates

Unit 1: Aviation Structures & Ecosystem Structures: Functional vs. matrix designs in airlines, airports, and authorities. Ecosystem & Governance: Interdependence between operators, ground handlers, and regulators; stakeholder management.

Unit 2: **Strategic & Crisis Management Strategy**: Fleet planning lifecycles, competitive positioning, and airline alliances. Crisis & Change: Handling market disruptions/fuel shocks; managing digital transformations and unions.

Unit 3:**Safety & Human Factors SMS & Just Culture**: Risk identification frameworks and non-punitive hazard reporting channels. Human Factors: Organizational behavior impacts on Crew Resource Management (CRM).

Unit 4: **Quality & Supply Chain Operations**: IOSA/ISO quality audits and Lean aircraft turnaround optimization Logistics: Aerospace supply chains, vendor relationships, and spare parts inventory loops.

Unit 5: **Regulations & Sustainability Compliance**: Global governance (ICAO/IATA) and state

authority auditing protocols. Sustainability: Corporate alignment with global carbon reduction and green mandates.

Reference Books

Sl. No.	Author/Publisher	Nomenclature of Book
1	John F. O'Connell & George Williams	Aviation Management: Global Perspectives
2	Gail F. Butler & Martin R. Keller	Handbook of Airline Strategy
3	Christopher A. Robertson	Managing Risk in Aviation

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Elective Practical Course
Semester I: AV512 MJP: Aviation Analytics & Airport Simulation Laboratory

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
2	2 Lectures/ Week	30	15 Marks	35 Marks

Course Objectives:

CO1	To calculate airline direct versus indirect operating costs and simulate dynamic airfare pricing to optimize seat yield.
CO2	To plot passenger flight demand trends and model aeronautical versus non-aeronautical airport revenue breakdowns.
CO3	To track runway aircraft queues and simulate terminal security checkpoint processing bottlenecks.
CO4	To visualize aircraft ground turnaround timelines and simulate terminal passenger evacuation path flows.
CO5	To resolve airport flight slot allocation conflicts and computes carbon emissions metrics according to CORSIA guidelines.

Experiments: (Any 6 out of 10)

1. To analyze and compare the direct and indirect operating costs of an airline.
2. To plot and evaluate passenger flight demand trends and seasonal variations.
3. To simulate and study dynamic airfare pricing strategies and revenue yield management.
4. To track and analyze aircraft runway queue times and takeoff delays.
5. To visualize and optimize the timeline of an aircraft's ground turnaround process.
6. To simulate and identify passenger bottlenecks at airport terminal security checkpoints.
7. To model and compare aeronautical and non-aeronautical revenue streams for an airport.
8. To allocate airport flight slots and resolve scheduling conflicts.
9. To simulate and optimize passenger evacuation paths in an airport terminal.
10. To calculate aviation carbon emissions based on CORSIA metrics and guidelines.

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

M. Sc. [Part- I] (Aviation)

Major Elective Practical Course

Semester I: AV513 MJP: Aviation Organizational Dynamics & Operations Control Laboratory

Credits	Teaching Hours	Total Practical's	Continuous Internal Assessment	End Semester Examination
2	2 Lectures/ Week	15	15 Marks	35 Marks

Course Objectives:

CO1	To model complex aviation matrix organizational structures and evaluate IATA Operational Safety Audit (IOSA) compliance scores.
CO2	To simulate crew pairing schedules, optimize flight rosters and model schedule recovery vectors during active flight disruptions.
CO3	To implement SMS risk matrices, classify operational hazards, and apply text analytics to voluntary safety reports.
CO4	To model communication delays within Crew Resource Management (CRM) and track aircraft ground turnaround bottlenecks.
CO5	To calculate optimal reorder points for aerospace spare parts and audit airline fleet carbon intensity performance.

Experiments: (Any 6 out of 10)

1. To map and analyze airline organizational structures and matrix reporting roles.
2. To simulate and optimize flight operations crew pairings and duty schedules.
3. To classify hazards and assess risks using a standard Safety Management Systems (SMS) matrix.
4. To analyze text from voluntary safety reports to detect repeating trends and hazards.
5. To model and evaluate communication delays and their impact on Crew Resource Management (CRM).
6. To calculate compliance scores based on IATA Operational Safety Audit (IOSA) standards.
7. To track and analyze aircraft ground turnaround delays and identify their root causes.
8. To calculate optimum reorder points for aircraft spare parts in an aviation supply chain.
9. To simulate and manage flight disruptions to recover schedules efficiently.
10. To audit and evaluate the carbon intensity performance of an airline's aircraft fleet.

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Core Compulsory Theory Course
Semester II: AV 551-MJ: Aircraft Maintenance Practices

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
4	4 Lectures/ Week	60	30 Marks	70 Marks

Course Objectives:

CO1	To introduce global aviation regulations (DGCA/EASA/FAA) and human error mitigation principles.
CO2	To teach workshop safety, hand/power tool handling, and maintenance manual documentation.
CO3	To cover maintenance practices for electrical wiring (EWIS), mechanical systems, and weight/balance calculations.
CO4	To explain Non-Destructive Testing (NDT) methods for detecting structural component defects.
CO5	To outline safe aircraft ground handling procedures and quality assurance standards.

Course Outcomes:

CO1	Explain airworthiness regulations and identify human performance limitations in maintenance.
CO2	Interpret engineering diagrams and apply standard workshop safety and tool procedures.
CO3	Inspect EWIS and mechanical components while verifying aircraft weight and balance limits.
CO4	Apply NDI techniques (ultrasonic, eddy current, dye penetrate) to identify material defects.
CO5	Execute safe ground handling tasks under strict maintenance quality control protocols.

Unit 1: Regulations & Human Factors Legislation: Roles of DGCA, EASA, and FAA; airworthiness rules and procedures. Human Factors: Performance limits, causes of human error, communication, and fatigue.

Unit 2: **Workshop Practices & Maintenance Safety & Tools**: Workshop safety precautions; hand, power, and precision measuring tools. Procedures: Disassembly, inspection, repair, reassembly, manuals, and planning documentation. Drawings: Interpreting standard engineering drawings and ATA-coded diagrams.

Unit 3: **Aircraft Systems Maintenance Electrical/Avionics**: EWIS maintenance, continuity, insulation, and bonding checks. Mechanical Systems: Maintenance of pipes, hoses, bearings, transmissions, and control cables. Weight & Balance: Calculation procedures and operational center-of-gravity limits.

Unit 4: Inspections & Ground Handling NDI Techniques: Dye penetrates magnetic particle, ultrasonic, and eddy current testing. Handling: Safe aircraft jacking, towing, refueling, and de-icing procedures. Quality Control: Basics of maintenance quality assurance and compliance controls.

Reference Books

Sl. No	Author/Publisher	Nomenclature of Book
1	Michael Kroes, Ronald Sterkenburg	Aircraft Maintenance and Repair 7th Edition
2	Aircraft Technical Book Company	Maintenance Practices for Aircraft Maintenance
3	Avotek	Aviation Maintenance Technician Reference Handbook
4	Federal Aviation Administration, U.S. Department of Transportation	Aviation Maintenance Technician Handbook

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

M. Sc. [Part- I] (Aviation)

Major Core Compulsory Theory Course

Semester II: AV 552-MJ: Aircraft Engine Performance & Health Analytics

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
4	4 Lectures/ Week	60	30 Marks	70 Marks

Course Objectives:

CO1	To teach gas turbine thermodynamic cycles, thrust equations, and component performance metrics.
CO2	To explain off-design engine behavior, component matching (compressor-turbine), and operational flight envelopes.
CO3	To introduce engine degradation mechanisms, sensor fault modes, and gas path analysis (GPA) concepts.
CO4	To detail predictive maintenance algorithms, vibration signatures, and oil debris analysis techniques.
CO5	To explore modern trends like engine digital twins, edge telemetry, and AI-driven health monitoring.

Course Outcomes:

CO1	Calculate thermal efficiency, thrust parameters, and fuel consumption metrics for propulsion cycles.
CO2	Analyze compressor and turbine performance maps to predict engine behavior at off-design altitudes.
CO3	Identify gas path faults and isolate sensor measurement noise from actual thermodynamic degradation.
CO4	Evaluate machine learning or statistical rules to estimate Engine Remaining Useful Life (RUL).
CO5	Utilize real-time flight data parameters to model intelligent engine health tracking systems.

Unit 1: **Engine Aerothermodynamics & Efficiencies Propulsion Cycles**: Ideal and real Brayton cycles; operation of turbojets, turbofans, and turboprops. Thrust Performance: Installed vs. uninstalled thrust; understanding Specific Fuel Consumption (SFC). Component Efficiencies: Thermal, propulsive, and isentropic efficiencies of inlets, compressors, burners, turbines, and nozzles.

Unit 2: Off-Design Performance & Component Matching Flight Environment: Effects of altitude, Mach number, temperature, and pressure changes on engine thrust. Operating Maps: Understanding compressor and turbine maps, surge margins, choking limits, and stall. Component Matching: Single-shaft and multi-spool engine equilibrium; monitoring transient operation lines.

Unit 3: Gas Path Analysis & Defect Modeling Engine Degradation: Structural impacts of engine fouling, blade erosion, corrosion, and tip clearance wear. Gas Path Analysis (GPA): Mapping engine health parameters to standard measurements like EGT, EPR, and Fuel Flow. Sensor

Noise: Filtering measurement noise and separating instrument failures from actual engine faults.

Unit 4: Prognostics, Health Management & Digital Twins Mechanical Faults: Basic vibration signature analysis, bearing wear tracking, and oil debris monitoring. Life Prediction: Estimating Remaining Useful Life (RUL) using data-driven statistical and machine learning models. Modern Trends: Implementing engine Digital Twins, cloud-based fleet telemetry, and predictive maintenance.

Reference Books

Sl. No.	Author/Publisher	Nomenclature of Book
1	Philip P. Walsh & Paul Fletcher (Units 1 & 2)	Gas Turbine Performance
2	Signal Processing and Data Analytics – Ranjan Ganguli (Unit 3)	Gas Turbine Diagnostics
3	Ian K. Jennions (Unit 4)	Integrated Vehicle Health Management: Implementation and Integration

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Core Compulsory Theory Course
Semester II: AV 553-MJ: Drone Technology & UAV Systems

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
2	2 Lectures/ Week	30	15 Marks	35 Marks

Course Objectives:

CO1	To classify drone architectures by weight/design and explore commercial applications and advanced materials.
CO2	To explain multi-rotor aerodynamics, BLDC motor mechanics, and Lithium-Polymer (LiPo) battery management.
CO3	To introduce inertial sensors (IMU), GNSS navigation, and open-source Pixhawk autopilot integration.
CO4	To detail RF telemetry communication, Ground Control Station (GCS) software, and auto-return fail-safes.
CO5	To review national drone regulations, airspace zoning maps, and pre-flight safety checklists.

Course Outcomes:

CO1	Select appropriate drone configurations and structural materials for specific industrial operations.
CO2	Analyze multi-rotor flight dynamics and configure BLDC motor and electronic speed control (ESC) systems.
CO3	Calibrate flight controller sensors and program automated waypoint logic for autonomous navigation.
CO4	Operate GCS software interfaces to monitor real-time telemetry links and establish safety fail-safes.
CO5	Comply with civil aviation rules, geo-fencing restrictions, and digital flight logging procedures.

Unit 1: Introduction & Architectures Classification: Types by weight and design (fixed-wing, multi-rotor, and hybrid). Applications: Key commercial uses in mapping, agriculture, and defense. Materials: Structural properties of carbon fiber and 3D polymers.

Unit 2: Aerodynamics & Propulsion Dynamics: Lift, thrust, and multi-rotor pitch/roll/yaw control mechanics. Motors: Working principles of BLDC motors and ESC controllers. Power: LiPo battery management, safety rules, and C-ratings.

Unit 3: **Flight Controllers & Sensors**: IMU integration, gyroscopes, accelerometers, and barometers. Navigation: GNSS/GPS position holding and waypoint logic. Autopilots: Core setups using open-source hardware like Pixhawk.

Unit 4: Telemetry & Ground Control Comms: RF data links, signal frequencies, and latency limits. GCS Tools: Real-time tracking using Mission Planner or Q Ground Control. Fail-Safes: Auto-return (RTL) logic for low battery or signal drops.

Unit 5: Regulations & Safety Rules: Licensing guidelines mandated by national civil aviation bodies. Zoning: Airspace boundaries (Green/Yellow/Red) and geo-fencing. Checks: Digital compliance protocols and pre-flight safety checklists.

Reference Books

Sl.No.	Author/Publisher	Nomenclature of Book
1	Paul G. Fahlstrom, Thomas J. Gleason, Mohammad H. Sadraey,	Introduction to UAV Systems, 5th Edition
2	I.V.S Yeswanth	Fundamentals of Drone Technology
3	Garvit Pandya	Basics of Unmanned Aerial Vehicles
4	A.R. Jha	Theory, Design, and Applications of Unmanned Aerial Vehicles
5	Sachi Nandan Mohanty, J.V.R. Ravindra, G. Surya Narayana	Drone Technology

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Core Compulsory Practical Course
Semester II: AV 554-MJP: UAS Simulation Lab

Credits	Teaching Hours	Total Practices	Continuous Internal Assessment	End Semester Examination
4	4 Lectures/ Week	15	15 Marks	35 Marks

Course Objectives:

CO1	To calculate rotor thrust limits relative to motor ratings and map Electronic Speed Controller (ESC) PWM duty cycles.
CO2	To simulate 2D drone kinematic trajectories, plot multi-point waypoints, and compute GPS distance/bearing coordinates.
CO3	To apply digital noise filters to raw Inertial Measurement Unit (IMU) data and design PID control loops for altitude holding.
CO4	To parse real-time Ground Control Station (GCS) telemetry packets and track battery capacity consumption limits.
CO5	To simulate automated geo-fencing airspace boundary alerts and chart autonomous Return-to-Launch (RTL) path vectors.

Experiments: (Any 6 out of 10)

1. To calculate and balance drone rotor thrust based on motor speed characteristics (k_v).
2. To plot and analyze a drone's 2D kinematic trajectory through assigned waypoints.
3. To simulate and filter raw accelerometer noise from an Inertial Measurement Unit (IMU).
4. To calculate the distance and bearing between two sets of GPS coordinates.
5. To simulate and tune a Proportional-Integral-Derivative (PID) loop for drone altitude hold.
6. To map and evaluate the PWM duty cycle outputs for an Electronic Speed Controller (ESC).
7. To parse and decode telemetry packets received from a Ground Control Station (GCS).
8. To monitor battery capacity consumption and simulate a low-voltage fail-safe trigger.
9. To detect airspace boundary violations using a simulated geo-fencing algorithm.
10. To simulate and plot the return-to-launch (RTL) autonomous path vectors for a drone.

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Core Compulsory Theory Course
Semester II: AV 581- OJT: On Job Training (Internship)

Evaluation Guidelines:

1. Weekly report from students
2. Attendance record
3. Certificate from the industry of completion of on job training/ internship
4. Viva in presence of industry experts and internal examiner

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Elective Theory Course
Semester II: AV 560-MJ: Aviation Law & Safety Management

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
2	2 Lectures/ Week	30	15 Marks	35 Marks

Course Objectives:

CO1	To teach the Chicago Convention framework, ICAO Annexes, and the Freedoms of the Air.
CO2	To explain national oversight roles (DGCA/FAA/EASA), airworthiness certifications, and licensing standards.
CO3	To introduce the four pillars of a Safety Management System (SMS) and risk assessment matrices.
CO4	To detail ICAO Annex 13 investigation protocols, hazard reporting, and Just Culture boundaries.
CO5	To outline aviation security treaties, commercial drone regulations, and international environmental policies.

Course Outcomes:

CO1	Interpret global transit rights and evaluate passenger liability claims under international conventions.
CO2	Assess compliance for aircraft airworthiness certification and personnel licensing requirements.
CO3	Implement SMS risk matrices to identify hazards and determine structural tolerability limits.
CO4	Apply non-punitive accident investigation protocols while distinguishing human error from negligence.
CO5	Comply with airport security mandates, drone zoning rules, and aviation carbon policies.

Unit 1: International Aviation Law Chicago Convention: Establishment of ICAO and the high-level Annexes structure. Freedoms of the Air: Core commercial transit and traffic rights (1st to 5th Freedoms). Liability: Passenger injury and baggage claims under Warsaw and Montreal Conventions.

Unit 2: National Regulatory Frameworks Oversight: Enforcement and auditing powers of state regulators (DGCA, FAA, EASA). Airworthiness: Legal compliance for Type Certificates and Certificates of Airworthiness. Licensing: regulatory standards for certifying pilots, crew, and engineers.

Unit 3: Safety Management Systems (SMS) Four Pillars: Safety Policy, Risk Management, Safety Assurance, and Safety Promotion. Risk metrics: Hazard identification, risk matrices, and tolerability limits. Governance: Roles of the Accountable Manager and safety action groups.

Unit 4: Investigations & Reporting Annex 13: ICAO protocols for non-punitive aircraft accident investigations. Reporting: Managing voluntary hazard reporting channels and flight data logs.

Just Culture: Legal limits separating honest human errors from gross negligence.

Unit 5: Security & Emerging Policy Security: Anti-hijacking treaties and airport security standards (Annex 17). UAV Laws: Rules for commercial drone licensing and airspace zoning. Environment: International aviation carbon markets and noise limits.

Reference Books

Sl.No.	Author/Publisher	Nomenclature of Book
1	AlanJ. Stolzer, JohnJ. Goglia	Safety Management Systems in Aviation
2	Anthony Lawrenson, Clarence C. Rodrigues	Commercial Aviation Safety
3	CarlD. Halford	Implementing Safety Management Systems in Aviation
4	Jerry Eichenberger	General Aviation Law
		DGCA Civil Aviation Requirements (CAR) Manual

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Elective Theory Course
Semester II: AV 561-MJ: Aviation Cyber Security

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
2	2 Lectures/ Week	30	15 Marks	35 Marks

Course Objectives:

CO1	To distinguish between aviation IT and Operational Technology (OT) and analyze cyber threat vectors.
CO2	To explain aircraft network isolation domains and data bus vulnerabilities (ARINC 429/664).
CO3	To identify security gaps in ground infrastructure, airport networks, and ACARS/ADS-B tracking signals.
CO4	To apply global cyber security frameworks (DO-326A) and multi-layered defense-in-depth protocols.
CO5	To outline cyber incident containment planning, human insider threats and regulatory reporting rules.

Course Outcomes:

CO1	Analyze cyber threat profiles and their operational or economic impacts on aviation networks.
CO2	Evaluate vulnerabilities within avionics safety domains, data buses, and software supply chains.
CO3	Assess risks of data injection, signal jamming, and spoofing across ATM and airport networks.
CO4	Implement risk assessment registries and multi-layered encryption filters based on global standards.
CO5	Formulate containment strategies for active cyber incidents and comply with anomaly reporting rules.

Unit 1: Aviation Cyber Threats Landscape: Evolution of e-enabled aircraft; IT vs. Operational Technology (OT) distinctions. Vectors & Impact: Malware, ransomware, spoofing, DoS targets, and their safety/economic impacts.

Unit 2: **Airborne & Avionics Security Domains**: Security isolation across Flight Deck, Cabin Core, and Passenger Entertainment networks. Data Bus & Supply Chain: Vulnerabilities in ARINC 429/664 (AFDX); risks in software updates and EFBs.

Unit 3: Ground & Air Traffic Security Signals: Communication security gaps in open ACARS and ADS-B tracking signals. Infrastructure: Securing airport networks (DCS, cargo, baggage) and protecting ATC from jamming/injection.

Unit 4: **Risk Management & Standards Frameworks**: Global compliance guidelines (ICAO, IATA, RTCA DO-326A/DO-356A). Defenses: Critical asset identification, threat risk registries, and defense-in-depth network firewalls.

Unit 5: **Incident Response & Culture Response**: Containment and recovery strategies for active aviation cyber incidents. Human Factors: Managing insider threats, social engineering, and mandatory anomaly reporting rules.

Reference Books

Sl. No.	Author/Publisher	Nomenclature of Book
1	Logan Jones	Aviation Cyber security: Scenarios, Models, and Approvals
2	RTCA/EUROCAE	Cyber security in Aviation – ICAO (Doc 10118) / Airworthiness and Cyber security (DO-326A/ED-202A)
3	Lane Thames & Dirk Schaefer	Cyber security for Industry 4.0 Analysis for Aviation and Aerospace

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

M. Sc. [Part- I] (Aviation)

Major Elective Practical Course

Semester II: AV 562-MJP: Aviation Safety Informatics Lab

Credits	Teaching Hours	Total Lectures	Continuous Internal Assessment	End Semester Examination
2	2 Lectures/ Week	30	15 Marks	35 Marks

Course Objectives:

CO1	To search and extract safety-critical keywords from aviation hazard reports and categorize accident root causes.
CO2	To scan Flight Data Recorder (FDR) parameters for limit exceedances and flag low-altitude terrain warnings.
CO3	To calculate hazard severity levels using interactive Safety Management System (SMS) risk matrices.
CO4	To audit pilot Flight Duty Period (FDP) limits and track Crew Resource Management (CRM) communication lapses.
CO5	To process METAR data for real-time weather alerts and plot bird-strike frequency trends across airports.

Experiments: (Any 6 out of 10)

1. To search and extract key hazard keywords from written aviation safety reports.
2. To analyze Flight Data Recorder (FDR) parameters to check for safety limit exceedances.
3. To calculate and classify hazards using a standard SMS risk matrix.
4. To classify aircraft accidents into standard root-cause and contributing factor categories.
5. To audit and verify pilot flight duty times against regulatory fatigue hours.
6. To decode METAR reports and simulate automated airport weather alerts.
7. To plot and analyze the location and frequency patterns of bird-strike incidents.
8. To simulate and flag low-altitude terrain proximity warnings for a flight path.
9. To analyze maintenance logs against Minimum Equipment List (MEL) constraints.
10. To track and identify communication errors during Crew Resource Management (CRM) exercises.

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
M. Sc. [Part- I] (Aviation)
Major Elective Theory Course Practical Course
Semester II: AV 563-MJP: Aviation Cyber Security Lab

Credits	Teaching Hours	Total Practices	Continuous Internal Assessment	End Semester Examination
2	4 Lectures/ Week	15	15 Marks	35 Marks

Course Objectives:

CO1	To teach wireless port scanning techniques on cabin Wi-Fi networks and analyzes open firewall packet filters.
CO2	To explain text encryption/decryption for ACARS data links and evaluate ADS-B signal anomalies or spoofing attempts.
CO3	To demonstrate firmware integrity checking using hashes verification on Electronic Flight Bags (EFBs).
CO4	To simulate bit-flipping data errors on ARINC 429 avionics data buses and analyze brute-force attack logs on airport Departure Control Systems (DCS).
CO5	To apply machine learning models to classify aviation insider threats and build automated risk assessment scripts mapping to DO-326A regulatory compliance.

Experiments: (Any 6 out of 10)

1. To scan a simulated cabin Wi-Fi network to find open, unsecured ports using Python.
2. To encrypt and decode operational ACARS text messages using a basic encryption script.
3. To identify spoofed or anomalous aircraft tracking data from simulated ADS-B flight logs.
4. To check Electronic Flight Bag (EFB) software integrity by matching cryptographic file hashes.
5. To simulate data errors and bit-flipping communication faults on an ARINC 429 bus.
6. To search airport login files to automatically detect and flag brute-force hacking attempts.
7. To write a script that classifies suspicious employee activity to detect insider security threats.
8. To calculate airworthiness security risk scores using standard DO-326A compliance rules.
9. To build a basic network packet filter to block unauthorized flight data traffic.
10. To scan computer text logs to match and find malicious aviation ransomware strings.