



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3140103

Semester –IV

Subject Name: Aircraft Systems, Instruments and Maintenance

Type of course: Professional Core Course

Prerequisite: Fundamentals of Aeronautical engineering

Rationale: Understanding of basics of aircraft Systems, Instruments and Maintenances must for an aeronautical engineer.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	Weight age
1	Aircraft Systems: Hydraulic Systems and Backup systems, Components of hydraulic systems, Modes of Operation, Pneumatic Systems, Working Principles, Typical Pneumatic Power System, Brake System , Components, Landing Gear Systems, Classification, Shock Absorbers, Retractable Mechanism, Oxygen System, Fire Protection System, De-Icing and Anti Icing System, Cabin Pressurization System, Lubrication System, Air Cycle System, Fuel supply system and fuel tank integration, Propeller Pitch control system, Propeller Synchronization System, Electrical system, Seat ejection system.	18	35%
2	Aircraft Instruments: Aircraft Pitot Static System and flight Instruments- Air Speed Indicator, Mach Meter, Vertical Speed Indicator, Altimeter. Gyro Instruments- Attitude Indicator, Directional Gyro Indicator, Turn Coordinator, Turn and Slip Indicator. Engine Instruments- Tachometer, Engine Pressure Ratio (EPR) Indicator, Cylinder head temperature gauge, Manifold pressure gauge, Exhaust temperature gauge, Fuel flow indicator.	12	20%
3	Flight Control Systems and components: Primary And Secondary Flight Control, Flap Position Indicator, Trim position Indicator. Flight Control Linkage Systems, Push-Pull Control Rod System, Cable And Pulley Systems, Flight Control Actuation, Linear Actuator, Mechanical Actuator, Mechanical Screw Jack Actuator, Turnbuckle, lock wires, Rod Ends, Eye Ends, Knuckle Joints, Lock Nuts, Levers, Bell Crank, Control Horns, Servo	8	10%



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	Arms.		
4	Aircraft Propulsion: Reciprocating Engine: Engine Components, Operation of 2 stroke and 4 stroke engines. Applications. Various cylinder configurations: Horizontally Opposed Engines, Radial engines, Inline engines, V Engines etc. Turbine Engines: Principle of operation, Design and Classification and components of Gas turbine engines, Thrust Augmentation methods, Thrust reversal and vectoring. Different types of Gas Turbine Engines. Engines start up and control system of Aircraft IC engine and Aircraft Gas turbine engines.	13	25%
5	Introduction to Aircraft Maintenance: Maintenance of aircraft and its components, systems and sub-systems. Types of maintenance schedules, Mandatory modification, Inspection of aircraft and components: Types of Inspections, Various Aircraft Manuals, Service Letters, Service Bulletin, Advisory Circulars, Repair, Modifications, Alteration, Reconditioning, History Card, Walk around inspection, Pre-flight checks.	9	10%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20%	25%	35%	10%	5%	5%

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Aircraft Systems”,David Lombardo,McGraw Hill
2. Mekinley, J.L. and R.D. Bent, Aircraft Power Plants, McGraw Hill 1993.
3. Aircraft Instrumentation and Systems”, S. Nagabhushana , L. K. Sudha, Ist edition IK Books.
4. Aircraft Maintenance and Repair (Sixth Edition)-TATA McGraw-Hill EDITION by-Croes, Watkins, Delp

Course Outcomes:

After completion of this course students shall be able to

Sr. No.	CO statement	Marks % weightage
CO1	Interpret various aircraft systems operation and their applications.	40
CO2	Infer and apply working principle of various types of aircraft instruments and	20



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	systems	
CO3	Distinguish different jet engines and apply maintenance procedure/check for an aircraft.	25
CO4	Elaborate the features of various flight control systems	15

List of Experiments:

1. Study of Miscellaneous Aircraft Instruments.
2. Starting system of Gas turbine Engine.
3. To study Compressor and Combustion Chamber of Gas turbine Engine.
4. To study Turbine and Exhaust of Gas turbine Engine.
5. To study Lubrication system of Gas turbine Engine.
6. To study Exhaust of Gas turbine Engine.
7. To study Fuel System of Gas turbine Engine.
8. To perform function of hydraulic system.
9. To perform function of pneumatic system.
10. Performance evaluation of Internal Combustion Engine.
11. To understand function of a retractable landing gear.
12. Introduction to Aircraft Rigging and Controls.

Major Equipment: Aircraft Instruments, Aircraft/ Aircraft Engine Miscellaneous System.

List of Open Source Software/learning website: <https://nptel.ac.in/course.php>