GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering
Level: UG
Branch: Aeronautical
Subject Code: BE04001031
Subject Name: Aircraft Systems and Instruments

w.e.f.Academic Year:	2025-26
Semester:	4
Category of the Course:	Professional Core Course

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

Course Outcomes:

Sr.No.	CO statement	Marks% weightage
CO-1	Understanding the concept of different types of aircraft system.	25
CO-2	Interpret pitot-static, gyro and engine instruments.	20
CO-3	Illustrate primary and secondary flight controls with actuation systems.	15
CO-4	Compare reciprocating and turbine engines with applications.	20
CO-5	Apply maintenance practices, inspection methods and documentation for airworthiness.	20

Teaching and Examination Scheme:

Teaching / Learning Scheme (in Hours per semester)					Total Credits	Assessment Pattern and Marks					Total Marks
						Theory		Tutorial / Practical			
L	T	P	PBL*	Total no of hours per semester		ESE (E)	PA / CA (M)	PA/CA (I)	PBL (I)	ESE (V)	
45	0	30	45	120	4	70	30	20	30	50	200

*** Problem Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.**

Content:

Sr. No.	Content	Total Hrs
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, Cabin Pressurization System, Lubrication System, Fuel supply system and fuel tank integration, Electrical system. Oxygen systems – Fire extinguishing system and smoke detection system, Deicing and anti-icing system. Air-conditioning System.	12
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.	8
3	**Flight Control Systems and components**: Primary And Secondary Flight Control, Flap Position Indicator, Trim position Indicator. Flight Control Linkage Systems, Push pull rod system – operating principles, Cable And Pulley Systems, Flight Control Actuation, Linear Actuator, Mechanical Actuator, Mechanical Screw Jack Actuator	7
4	**Propulsion System:** 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. Turbine Engines: Principle of operation, Classification and components of Gas turbine engines	9
5	**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
	TOTAL	**45**

Suggested Specification table with Marks (Theory): (ForB.E.only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40	**40**	**10**	**10**	**00**	**00**

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

Note: This specification table shall be treated as a general guide line 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. McKinley, 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

List of Experiments:

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

Major Equipment:

Aircraft Instruments, Aircraft/ Aircraft Engine Miscellaneous System

List of Open Source Software/learning website:

https://nptel.ac.in/course.php

- **List of suggested activities for Problem Based Learning:**

Sl. No.	Name of the activity	No. of hours	Evaluation Criteria
1.	Industry/Research laboratory visit	Visit = 5h, Report preparation = 5h Total = 10h	Based on report submitted. Report should contain observations and calculations based on industry/ lab data.
2.	Technical Video based learning related to the subject	Duration of video = 5h Report preparation = 5h Total = 10h	Report /presentation based on the video learning outcomes.
3.	Assignment writing. Numericals based assignment is preferable.	5 assignments of 2h each. Total = 10h	Based on the assignment submitted.
4.	Problem solving/Coding using C, C++, Python, SCILAB, MATLAB, MS-EXCEL or any other relevant software	5 small coding based assignment of 2h each. Total = 10h	Based on the coding solution submitted.
5.	Self learning on-line course	Minimum duration of the course should be 10h.	Examination based assessment at the end of course. Based on the certificate produced.
6.	Complex problem solving	Maximum 2 problem. Study of the problem and solution finding, Total = 10h	Based on the depth of the solution submitted.
7	Videos on Industrial safety aspects based on subject	Duration of video = 5h Report preparation = 5h Total = 10h	Based on quiz/report submitted
8	Discussion on research paper based on relevant subject	5 research paper = 20 h	Summarize research paper and evaluation critical parameters
9.	Poster/chart/power point preparation on technical topics	Duration = 6 h	Based on poster/chart preparation and presentation skills
10	Working/non-working model on technical topics	Working = 12 h Non- working = 8 h	Based on inter department/external evaluation

11	Industrial exposure for 2-3 days to observe and provide tentative solutions on society/environment/health/any other issue	Duration = 15 h for industrial exposure Problem identification and tentative solution = 10 h Total = 20 h	Based on evaluation of critical problems and solutions
12	Group Discussion on emerging/trending technical topics based on subject	Duration = 1 h each	Based on performance in group discussion, technical depth, knowledge etc.
13.	Real world case studies-based learning	Duration of data collection/study = 5h Report preparation = 5h Total = 10h	Based on in-depth study, technical depth, data collected, fact finding, etc.
14.	Application/Software development	Duration = 10 h	Depending on the complexity of the Application/Software

Note:

1. All the suggested activity should be related to the subject.

2. The number of hours are suggestive. Faculty can sub-divide the number of hours based on the activity. However, total number of hours is fixed.

3. Rubrics for the evaluation can be prepared by the faculty.

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