GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3140111
Semester –IV
Subject Name: Avionics

Type of course: Professional Core Course

Prerequisite: Fundamentals of Aeronautical engineering

Rationale: This subject will help students about understanding Aviation electronics systems of military and civil aviation aircrafts with respect to applications in commercial or defense related operations.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	Weightage
1	**Introduction to Avionics:** Need for avionics in civil and military aircraft and space systems, Integrated avionics and weapon systems, Typical avionics subsystems, design and technologies, Introduction of Avionics Architecture, Flight deck design with respect to Avionics.	4	10%
2	**Introduction to Navigation and Approach System**: DVOR, Errors in Direction Finding, Distance Measuring Equipment (DME) Integration with VOR and NDB, Instrument Landing System (ILS) Approach, Microwave Landing Systems (MLS), Tactical Air Navigation (TACAN), VOR & TACAN (VORTAC),Identification friend or foe (IFF), Ground Controlled Approach(GCA),Head up Display(HUD), Multifunctional Keypad(MFK), Hands On Throttle And Stick (HOTAS), Inertial guidance system, Inertial navigation system, , Fly by Wire flight controls, Night vision goggles, Auto Pilot system, Auto Throttle System	16	30%
3	**Radar and Space Avionics System:** Primary ground radar, Secondary surveillance radar (SSR), Transponder, Radar display & data processing systems, Radar altimeter , Radar Ground Proximity Warning System (GPWS), Enhanced Ground Proximity Warning System (EGPWS), Doppler radar, Airborne Weather Radar (AWR), Traffic Collision Avoidance System (TCAS), Global Positioning System, Satellite Communication System, Indian Regional Navigation Satellite System (IRNSS), Airborne (Early) Warning and Control System (AWACS)	14	25%
4	**Navigation Instruments:**	6	20%

	Electronic Flight Instrument system(EFIS), Flight, director system, Flight Management system, Black Box-Flight Data and cockpit voice Recorder, Autopilot Flight director system		
5	**Emergency Locator Transmitter(ELT):** Types of ELT, Maintenance and testing of ELT, ELT mounting requirements, Typical ELT, HF range and propagation, SSB-DSB modulation, Selective Calling System(SELCAL), HF radio equipment.	5	15%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20%	**20%**	**30%**	**15%**	**10%**	**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 communication and navigation systems by Mike Tooley and David Wyatte, A Butterworth-Heinemann Title (15 August 2007) Publication
2. Digital Avionics Systems, by C R Spitzer, CRC press Publication
3. The Avionics Handbook, by Ed. Cary R. Spitzer, Boca Raton, CRC Press LLC. 2001
4. Principles of Avionics by Albert Helfrick , Avionics communications Inc. Leesburg, VA, USA
5. Military Avionics by Ian Moir & Allan Seabridge, John Wiley & Sons, Ltd.
6. Avionics Systems by D H Middleton, Longman Scientific & Technical, 1989.
7. Manual of Avionics by Brian Kendal, Blackwell Science Ltd.

Course Outcomes:
After completion of this course students shall be able to

Sr. No.	CO statement	Marks % weightage
CO1	Describe various navigation system.	45
CO2	Demonstrate radar system used in civil and military aviation.	25
CO3	Dissect avionics systems to monitor and record flight data.	15
CO4	Interpret aircraft emergency system.	15

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List of Experiments:

Sr No	Title
1.	To study operation of modulation and demodulation for amplitude and frequency.
2.	To study about Multifunction display.
3.	To understand about Traffic Collision Avoidance System.
4.	To perform function of Annunciator Panel.
5.	To study Function of GPS (Global Positioning System) and EGPWS (Enhanced Ground Proximity Warning System).
6.	To study the fundamental concepts of Doppler Radar.
7.	To determine the speed moving object from different angles and the size of moving object with the Doppler radar.
8.	To study satellite communication system.
9.	To study radio control system of Unmanned Aerial Vehicle.
10.	To understand about channel mixing with respect to integrated control surfaces.

Note: If possible, students should be given practical exposure of Indian Regional Navigation Satellite System.

Major Equipment: 6 Channel Radio Control System, Portable Doppler radar, Mechanical Stop Watch GPS apparatus, Annunciator Panel

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