GUJARAT TECHNOLOGICAL UNIVERSITY

AERONAUTICAL ENGINEERING
AVIONICS
SUBJECT CODE: 2160106
B.E. 6th SEMESTER

Type of course: Engineering Science

Prerequisite: Basics of Electrical and Electronics, Aircraft Science

Rationale: Avionics is one of the core areas in the field of aviation. The concepts of avionics are vitally important to the aeronautical engineer.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Navigation and Approach Aids:** Evolution of avionics, Avionics as total system Non Directional Beacons (NDB) Automatic Direction Finders (ADF) Very High Frequency Omni Range (VOR), DVOR, Errors in Direction Finding Distance Measuring Equipment (DME) Instrument Landing System (ILS) Microwave Landing Systems (MLS) Tactical Air Navigation (TACAN) VOR & TACAN (VORTAC)	**10**	**30**
2	**Radar:** Primary ground radar Secondary surveillance radar (SSR) Radar display & data processing systems Radar altimeter, Radar Ground Proximity Warning System (GPWS) Doppler radar Airborne Weather Radar (AWR) Traffic Collision Avoidance System (TCAS)	**10**	**15**
3	**Space Systems** Global Positioning Systems	**4**	**15**

	Satellite communication systems		
4	**Miscellaneous systems** Fly-By-Wire Flight Controls Flight Management System	**2**	**15**
5	**Military Avionics** Military Avionics Night Vision goggles Speech recognition and Synthesis Human Factor Engineering and Flight Deck Design Electronic Warfare Airborne early warning system Evolution of avionics architecture Avionics Architecture by Joint Integrated Avionics	**10**	**25**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
35%	**25%**	**20%**	**15**	**5**	**0%**

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. Manual of Avionics By Brian Kendal
2. Digital Avionics Systems by C R Spitzwer
3. Principles of Avionics by Albert Helfrick
4. Avionics Systems by D H Middleton
5. From the ground up by Himalayan Books
6. Military Avionics by Ian Moir & Allan Seabridge

Course Outcome:

After learning the course the students should be able to

learn about fundamental principles and applications of avionics equipments.

List of Experiments:

1. To Study purpose of Function Generator.

2. To study Working of annunciator

3. To study Function of GPS.

4. To study operation of amplitude modulation & demodulation.
5. To study operation of frequency modulation & demodulation.
6. To study operation of Pulse width modulation & demodulation.
7. To investigate the fundamental concepts of Doppler Radar.
8. To determine speed of moving ball.
9. To detect the presence of a hidden time bomb with the help of a Doppler radar.
10. To determine the speed moving object from different angles and the size of moving object with the Doppler radar.
11. To measure the distance traveled using radar.
12. To camouflage the object using RADAR absorbing material and to study climatic conditions of atmosphere cyclones, tornado, clouds using Doppler radar.
13. To study Microwave system.
14. To study satellite communication system (SATCOM).

Design based Problems (DP)/Open Ended Problem:

1. Make a model of Runway in use- 23-05. Instrument landing system on runway 23. Draw 25 Nm DME ARC. For landing locate LOC, DME, GLIDE slope, MARKER BEACONS, LOCATOR NDB, VOR, etc.
2. Aircraft is flying on Radial 0.45. OBS is indicating 047. Draw Dial for the same.
3. Aircraft is approaching on landing runway 23 & established localizer at 6 DME. Draw the dial of ILS if aircraft is slightly left of runway centerline & slightly above glide slope centerline.

Major Equipment: Flight simulator software, joy stick, rudder paddle set, computer, approach charts, navigation maps, cockpit instrument panel charts

List of Open Source Software/learning website: http://nptel.iitm.ac.in/ , youtube.com

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.