

## 4/4 B.Tech - SEVENTH SEMESTER

EC 7T5D

Introduction to Avionics

Credits: 4

Lecture : 4 periods/week

Tutorial: 1 period /week

Internal assessment: 30 marks

Semester end examination: 70 marks -----

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### Course Objectives:

- To introduce role of avionics system and its architecture
- To understand the trends in display technology
- To understand the avionics system design development and integration using simulation
- To study system assessment, validation, certification and maintenance of avionics system

### Learning Outcomes:

- Describe the basic principles of operation of the avionics systems and their sub-systems that make up a typical integrated system
- Describe the information required and generated by the sub-systems of avionics systems
- Describe to block diagram level the operation of an integrated avionics system of a typical modern aircraft.

### UNIT- I

**Introduction:** Importance and role of avionics, avionic environment, Regulatory and advisory agencies,

**Displays and man-machine interaction:** Head up displays, helmet mount displays, discussion of HUDs vs. HMDs, Head down displays, data fusion, intelligent displays management, Displays technology, control and data entry, instrument placement

### UNIT- II

**Aircraft sensor systems and indicators:** Aircraft state sensors: Air data information and its use, Air data sensors and air data systems, air stream direction detection; Inertial referencesystems: Gyros and accelerometers, attitude derivation. RMI, HIS, ADI; Outside world sensor systems: Radar systems, Infrared systems

### UNIT- III

**Navigation systems:** Principles of navigation, Terrestrial en route navigation and lading aids, Inertial Navigation, Aided Inertial Navigation systems and Kalman filters, GPS-global positioning system, terrain reference navigation

### UNIT- IV

**Surveillance systems:** Air traffic control, Primary radar, Secondary radar, Replies, Various system modes, error checking, Transponders of ATCCRB & Mode S, Collision avoidance, Lightning detection, Weather radar

## **UNIT- V**

**Airborne communications systems:** VHF AM Communications, VHF Communications hardware, High frequency communications, ACARS, SELCAL, Digital Communications and Networking, VHF Digital communications, Data link Modes

## **UNIT- VI**

**On-board communications:** Microphones, Digital communications, Transmission lines, Digital data bus systems ARINC 426, MIL STD 1553, ARINC 629, Commercial standard digital bus, Fiber optic communication

## **UNIT- VII**

**Avionic systems integration:** Data bus systems, integrated modular avionics, commercial off-the shelf (COTS)

## **UNIT -VIII**

**Unmanned air vehicles:** Importance of Unmanned air vehicles, UAV avionics

### **Learning Resources**

#### **Text Books:**

1. Introduction to Avionics, Collinson RPG, Kluwer Academic Publishers, Chapman & Hall, 2<sup>nd</sup> Edition., 2003.
2. Principles of Avionics, Albert Helfrick, Avionics Communication Inc. 2<sup>nd</sup> Edition, 2002

#### **References:**

1. Avionics Systems, Middleton, D.H., Ed, Longman Group UK Ltd., England, 1989.
2. Manual of Avionics, Brain Kendal, The English Book House, 3<sup>rd</sup> Edition, New Delhi, 1993.