

# AEROSPACE

## SHORT COURSES

### **Fundamental Avionics (AERO0310)**

**Instructor: Albert Helfrick**

#### **Course Description**

This course provides a very broad overview of avionics. It covers the historical evolution of the avionics industry and usage of avionics to the present day. This gives the student an understanding of why avionics is what it is today, in addition to understanding how it works. The course covers legacy systems still in use and the latest state-of-the-art systems currently being installed. The avionics environment is an important part of this course. In the context of this course, "environment" refers not only to the physical environment of pressure, temperature, vibration, etc. but the regulatory environment. Systems are an important part of this course, and system communications and assessment are covered. This course introduces the student to the unique language of avionics (abbreviations, terms and acronyms) and connects these terms to the systems they represent.

#### **Learning Objectives**

- The evolution of the industry and the need for regulation, standards, certification, etc. for safe and effective avionics
- The basic foundation of navigation and the need for navigation aids that allow safe flight in reduced visibility conditions
- The science of radio signals, generation and transmission to provide signals-in-space for navigation
- The need for airborne communications and the necessary systems
- Understand space-based navigation and its role in present and future navigation

#### **Who Should Attend?**

This course is for engineers and technicians involved with avionics but may not have attended formal courses in avionics. It would also suit those who work in a specific area of avionics and who would benefit from learning the latest developments in areas outside of their discipline or a brush-up on basics.

#### **Course Highlights**

- A very comprehensive overview of avionics from the early years to the present
- Covers the fundamentals of navigation, communications and surveillance
- Explains the roles of world-wide regulatory and advisory groups
- Introduces future systems currently under development and equipage

- Special emphasis on satellite-based navigation; the backbone of future navigation and surveillance
- Covers safety assessment and human factors as associated with avionics systems

## **Course Outline**

### **Day One**

- Early history of aviation and wireless
- History of regulatory and advisory bodies
- Establishment of the World-wide Airspace System
- Federal Aviation Regulations, FAR
- European regulatory and advisory agencies
- Introduction to radio navigation
- Antennas and radio beams
- Non-directional beacon
- VHF Omni range, VOR
- Distance measuring, DME
- TACAN

### **Day Two**

- Hyperbolic Navigation, LORAN, multi-lateration
- Landing Systems, ILS
- Radar altimeter
- Ground proximity warning systems
- Terrain Awareness and Warning System, TAWS
- Satellite navigation
- Global positioning system, GPS

### **Day Three**

- Secondary radar, Mode A/C, Mode S
- Collision avoidance, TCAS
- Automatic Dependent Surveillance, Broadcast, ADS-B
- Weather radar
- Lightning detection
- Airborne communication
- Aeronautical telecommunications network, ATN
- Data buses/networking, ARINC 429, Mil 1553, AFDX
- Compass/gyros
- Air data systems

### **Day Four**

- Inertial navigation
- Laser gyros

- Random Navigation, RNAV
- Required Navigation Performance, RNP Displays
- Human factors
- Electromagnetic compatibility
- High intensity radiated fields, HIRF
- Lightning effects

### **Day Five**

- Airborne environment, DO-160
- Failure analysis
- Safety assessment
- Design assurance levels
- Reliability prediction, MIL-HDBK 217
- Software considerations, DO-178
- Hardware considerations, DO-254
- Flight data recorder
- Cockpit voice recorder
- Reliability and safety analysis

### **Classroom hours / CEUs**

35 classroom hours

3.5 CEUs

### **Certificate Track**

Avionics and Avionic Components

### **Course Fees**

Early registration course fee: \$2,595 if you register and pay by the early registration deadline (45 days out).

Regular registration course fee: \$2,795 if you register and pay after the early registration deadline.

### **Course Materials**

Course materials, including outlines, presentation copies, and supplementary materials, will be accessible through Canvas, KU's online learning system. Instructions to access Canvas will be provided upon completed registration. Students are required to bring a computer or other electronic device with PDF-viewing capabilities with them to class each day. If you require accommodation contact us at [professionalprograms@ku.edu](mailto:professionalprograms@ku.edu) and we will work with you on an accessible solution.

### **U.S. Federal Employee Discount**

This course is available to U.S. federal employees at 10% off the registration fee. To receive the federal employee discount, you must enter the code **FGVT116** during the checkout process. Please note that you must validate your eligibility to receive this discount by entering your U.S. government email address (ending in .gov or .mil) when creating your online registration profile. This discount is available for both the early registration and regular registration fees.

### **Canada Department of National Defence Discount**

This course is available to Canada DND employees at 10% off the registration fee. Please contact the DND Procurement Authority (DAP 2-3) for details. Please note that you cannot register using our online system when requesting this discount. This discount is available for both the early registration and regular registration fees.

### **Instructor Bio**

**Albert Helfrick** is Professor Emeritus and former chair of the electrical and systems engineering department at Embry-Riddle Aeronautical University. Previously, he was director of engineering for Tel-Instrument Electronics, a manufacturer of avionics test equipment. Before entering academia, he was a self-employed consulting engineer for four years where he and his company designed fire and security systems, consumer items and avionics. He has more than 50 years of experience in various areas of engineering including communications, navigation, precision testing and measurement, radar and security systems. He performed radiation hardening on military avionics, designed test equipment for the emerging cable television industry, designed general aviation avionics for Cessna Aircraft and precision parameter measuring and magnetic systems for Dowty Industries. Helfrick is the author of 12 books, numerous contributions to encyclopedias, handbooks and other collections. He has more than 100 technical papers and presentations, served as an expert witness in a number of civil cases and testified before Congress. He holds five U.S. patents, is a registered professional engineer in New Jersey, a Life Senior Member of the IEEE, and an associate fellow of the AIAA. Helfrick has received the AIAA Dr. John Ruth Digital Avionics award. He holds a B.S. in physics from Upsala College, M.S. in mathematics from New Jersey Institute of Technology and a Ph.D. in applied science from Clayton University.

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