**EX725 04**

**Course Objectives**:  
To give the basic understanding of aviation related ground based electronics equipment used for Communication, Navigation and Surveillance and their theory of operation.

1. **Introduction to Aviation [4 hrs]**  
   History of Aviation, Aircraft, Airport, Airspace, Air Traffic Control and Air Traffic Management

1. **Aeronautical Communication [5 hrs]**  
   Aviation Band , ICAO and ITU , VHF Air to Ground communication, HF Ground to Ground communication, Interference, Data link, AFTN/ATN/AMHS

1. **Aeronautical Navigation[9 hrs]**
   1. **Introduction**  
      Introduction to Navigation, Piloting, Dead Reckoning, Radio Navigation, Ground Based Navigation System
   2. **Non Directional Radio Beacon (NDB)**  
      NDB as a navigational aid, working principle, Uses of NBD, Advantages of NBD, Limitations of NDB , Sitting Requirements, Antenna System, Types of Antennas, Factors affecting NDB Antenna, Role of Top, loading, Transmitting equipment, Monitoring and Calibration.
   3. **VHF Omni Directional Radio Range (VOR)**  
      VOR as a navigational aid, Frequency band, general principal of operation, basic VOR transmission techniques, rotation of cardioids, VOR errors, sitting requirements, Doppler VOR (DVOR), principal of operations of DVOR and its types, advantages of DVOR over conventional VOR, airborne VOR receiver, antenna system, conventional and Doppler VOR antenna, Transmitting techniques (i) conventional VOR (ii) Doppler VOR, monitoring and calibration.

1. **Aeronautical Equipment [9 hrs]**
   1. **Distance Measuring Equipment (DME)**  
      DME as a navigational aid, principal of operation, applications, Gaussian pulse, DME errors and echo suppression techniques, Airborne Interrogator, Sitting requirements, antenna system, monitoring and calibrations
   2. **Instrument Landing System (ILS)**  
      ILS as a landing aid, co-location of DME with ILS, coverage of an ILS, Marker Beacons, siting requirements, general transmitting techniques, generation of DDM, localizer and glide slope equipment and antenna system.

1. **Aeronautical Surveillance[8 hrs]**  
   History of Radar, Types of  Airport Surveillance Radar, Theory of Primary and Secondary Surveillance Radar, Monopulse SSR and Mode-S, Radar Data Processing System, Introduction to Automatic Dependence Surveillance and Multi Lateration system.

1. **Aeronautical Mobile Satellite System (AMSS) and Global NavigationSatellite system (GNSS)[4 hrs]**  
   International maritime satellite System (Inmarsat), International Telecommunication Satellite System (Intelsat), Global Positioning System (GPS), Global Orbiting Navigation Satellite System (GLONASS).

1. **Basics of Aircraft Avionics Equipment[6 hrs]**  
   Aircraft HF, VHF and Satellite Communication equipment, Radio compass, Radio Magnetic Indicator (RMI), Horizontal Situation Indicator, Automatic Direction Finder, SSR Tansponder, Flight Data and Voice Recorders.

**Practical**

1. Field visits to Avionics Communication Stations and Centers.
2. Reports writing on various Surveillance/Navigation/Other  Instruments which are specific to avionics communication

**References**

1. Seamless Sky by H.V Sudarsan Published by "Ashgate Publishing limited,  England".
2. Aviator’s Guide to Navigation, Donald J. Clausing
3. Principles of communication, J.S. Chitode
4. Aeronautical Radio Communication system and Networks, Dale Stacey.
5. International Civil Aviation Organization, Global Air Navigation Plan for
6. CNS/ATM systems (Doc9750)

**Evaluation Scheme**  
The questions will cover all the chapters of the syllabus. The evaluation scheme will be as indicated in the table below:

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| --- | --- | --- |
| **Chapters** | **Hours** | **Marks Distribution\*** |
| 1,2 | 4,5 | 16 |
| 3 | 9 | 16 |
| 4 | 9 | 16 |
| 5 | 8 | 16 |
| 6,7 | 4,6 | 16 |
| **Total** | **45** | **80** |

\*There could be a minor deviation in Marks distribution