

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Title      | Aircraft System (Avionics Repair and Maintenance)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 2. Code       | EMAMBX501A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 3. Range      | The knowledge is needed for a wide range of aircraft repair and maintenance works, e.g. applicable to aircrafts, analysis, machineries, airworthiness, airframes, avionics, materials, tests, documentation, safety, health and tools etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 4. Level      | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 5. Credit     | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 6. Competency | <p style="text-align: center;"><u>Performance Requirement</u></p> <p>6.1 Knowledge</p> <ul style="list-style-type: none"> <li>◆ Able to understand the theory of aeroplane aerodynamics and flight controls <ul style="list-style-type: none"> <li>• Operation and effect of: <ul style="list-style-type: none"> <li>▸ Roll control: ailerons and spoilers.</li> <li>▸ Pitch control: elevators, stabilators, variable incidence stabilisers and canards.</li> <li>▸ Yaw control, rudder limiters.</li> </ul> </li> <li>• Control using elevons, ruddervators.</li> <li>• High lift devices, slots, slats, flaps, flaperons.</li> <li>• Drag inducing devices, spoilers, lift dumpers, speed brakes.</li> <li>• Operation and effect of trim tabs, servo tabs, control surface bias.</li> </ul> </li> <li>◆ Able to understand the theory of high speed flight <ul style="list-style-type: none"> <li>• Speed of sound, subsonic flight, transonic flight, supersonic flight, Mach number, critical Mach number.</li> </ul> </li> <li>◆ Able to understand the rotary wing aerodynamics <ul style="list-style-type: none"> <li>• Terminology.</li> </ul> </li> </ul> |

- Operation and effect of cyclic, collective and anti-torque controls.
- ◆ Able to understand the general concept of the airframe structures
  - Fundamentals of structural systems.
  - Zonal and station identification systems.
    - Electrical bonding.
    - Lightning strike protection provision.
- ◆ Able to understand the autoflight (ATA 22)
  - Fundamentals of automatic flight control including working principles and current terminology.
  - Command signal processing.
  - Modes of operation: roll, pitch and yaw channels.
  - Yaw dampers.
  - Stability Augmentation System in helicopters.
  - Automatic trim control.
  - Autopilot navigation aids interface.
  - Flight Management System (FMS). navigation database.
  - Autothrottle systems.
  - Automatic Landing Systems: principles and categories, modes of operation, approach, glideslope, land, go-around, system monitors and failure conditions, downgrade and upgrade procedures.
- ◆ Able to understand the communication / navigation (ATA 23 / 34)
  - Fundamentals of radio wave propagation, antennas, transmission lines, communication, receiver and transmitter.

- Principles and methods used to minimise the effects of interference.
- Standing wave ratio and its calculation.
- Working principles of following systems:
  - › Very High Frequency (VHF) communication.
  - › High Frequency (HF) communication.
  - › Audio Systems.
  - › Emergency Locator Transmitters.
  - › Cockpit Voice Recorder.
  - › Very High Frequency Omni-directional Range (VOR).
  - › Automatic Direction Finding (ADF).
  - › Instrument Landing System (ILS).
  - › Microwave Landing System (MLS).
  - › Flight Director systems.
  - › Distance Measuring Equipment (DME).
  - › Satellite Communication (SATCOM).
  - › Doppler navigation.
  - › Area navigation, RNAV systems.
  - › Global Positioning System (GPS), Global Navigation Satellite Systems (GNSS).
  - › Inertial Navigation/Reference System.
  - › Air Traffic Control (ATC) transponder, secondary surveillance radar.
  - › Traffic Alert and Collision Avoidance System (TCAS).
  - › Weather avoidance radar.
  - › Radio altimeter.
  - › ARINC Communication Addressing and Reporting System (ACARS).
- ◆ Able to understand the electrical power (ATA 24)
  - Batteries Installation and Operation.

- DC power generation.
- AC power generation.
- Emergency power generation.
- Voltage regulation.
- Power distribution.
- Inverters, transformers, rectifiers.
- Circuit protection.
- External / Ground power.
- ◆ Able to understand the equipment and furnishings (ATA 25)
  - Electronic emergency equipment requirements.
  - Cabin entertainment equipment.
- ◆ Able to understand the flight controls (ATA 27)
  - Primary controls: aileron, elevator, rudder, spoiler.
  - Trim control.
  - Active load control.
  - High lift devices.
  - Lift dump, speed brakes.
  - System operation: manual, hydraulic, pneumatic.
  - Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks.
  - Stall protection system.
  - System operation: electrical, fly wire.
- ◆ Able to understand the instrument systems (ATA 31)
  - Classification.
  - Atmosphere.
  - Terminology.
  - Pressure measuring devices and systems.
  - Pitot static systems.
  - Altimeters.

- Vertical speed indicators.
- Airspeed indicators.
- Machmeters.
- Altitude reporting / alerting systems.
- Air data computers.
- Instrument pneumatic systems.
- Direct reading pressure and temperature gauges.
- Temperature indicating systems.
- Fuel quantity indicating systems.
- Gyroscopic principles.
- Artificial horizons.
- Slip indicators.
- Directional gyros.
- Ground Proximity Warning Systems.
- Compass systems, compensation and adjustment.
- Flight Data Recording systems..
- Electronic Flight Instrument Systems.
- Instrument warning systems including master
- warning systems and centralised warning panels.
- Stall warning systems and angle of attack
- indicating systems.
- Windshear Detection and Warning System.
- Vibration measurement and indication.
- ◆ Able to understand the lights system (ATA 33)
  - External: navigation, anti-collision, landing, taxiing, ice.
  - Internal: cabin, cockpit, cargo.
  - Emergency.

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | <ul style="list-style-type: none"> <li>◆ Able to understand the On Board Maintenance Systems (ATA 45) <ul style="list-style-type: none"> <li>• Central maintenance computers.</li> <li>• Data loading system.</li> <li>• Electronic library system.</li> <li>• Printing.</li> <li>• Structure monitoring (damage tolerance monitoring).</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                     |
| 6.2 Theoretical and practical aspects | <ul style="list-style-type: none"> <li>◆ Able to apply the following knowledge in the aircraft maintenance. <ul style="list-style-type: none"> <li>• General concepts of airframe structures <ul style="list-style-type: none"> <li>▸ Zonal and station identification systems.</li> </ul> </li> <li>• Autoflight (ATA 22)</li> <li>• Communication / Navigation (ATA 23 / 34)</li> <li>• Aeroplanes airframe structures</li> <li>• Electrical power (ATA 24)</li> <li>• Equipment and furnishings (ATA 25)</li> <li>• Flight controls (ATA 27) <ul style="list-style-type: none"> <li>▸ System operation.</li> </ul> </li> <li>• Instrument systems (ATA 31)</li> <li>• Lights (ATA 33).</li> <li>• On board maintenance systems (ATA 45).</li> </ul> </li> </ul> |
| 6.3 Professional approach             | <ul style="list-style-type: none"> <li>◆ Able to understand the principal elements of the subjects.</li> <li>◆ Able to understand the general knowledge of the theoretical and practical aspects of the following subjects. <ul style="list-style-type: none"> <li>• General concepts of airframe structures</li> <li>• Zonal and station identification systems.</li> <li>• Flightcontrols (ATA 27) <ul style="list-style-type: none"> <li>▸ System operation.</li> </ul> </li> <li>• On board maintenance systems (ATA 45)</li> </ul> </li> </ul>                                                                                                                                                                                                                |

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        | <ul style="list-style-type: none"> <li>◆ Able to apply the knowledge in the aircraft maintenance task.</li> <li>◆ Able to understand the detailed knowledge of the theoretical and practical aspects of the following subjects. <ul style="list-style-type: none"> <li>• Autoflight (ATA 22)</li> <li>• Communication / Navigation (ATA 23 / 34)</li> <li>• Electrical power (ATA 24).</li> <li>• Equipment and furnishings (ATA 25)</li> <li>• Instrument systems (ATA 31)</li> <li>• Lights (ATA 33).</li> </ul> </li> <li>◆ Able to combine and apply the separate elements of knowledge in a logical and comprehensive manner.</li> </ul>                                                                                                                                                                                      |
| 7. Assessment Criteria | <p>The integral outcomes requirement of this UoC are:</p> <ul style="list-style-type: none"> <li>(i) Able to understand the theory of the subjects and interrelationships with other subjects.</li> <li>(ii) Able to give a detailed description of the subject using theoretical fundamentals and specific examples.</li> <li>(iii) Able to understand and be able to use mathematical formulae related to the subject.</li> <li>(iv) Able to read, understand and prepare sketches, simple drawings and schematics describing the subject.</li> <li>(v) Able to apply the knowledge relating to avionics repair and maintenance in a practical manner using manufacturer's instructions.</li> <li>(vi) Able to interpret results from various sources and measurements and apply corrective action where appropriate.</li> </ul> |
| 8. Remarks             | Ref: HKAR-66 Module 13: Aircraft aerodynamics, structures and systems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |