

1. Title	Aeroplane aerodynamics, structures and systems I
2. Code	EMAMAA401A
3. Range	The knowledge is needed for a wide range of aeroplane repair and maintenance works, e.g. applicable to aircrafts, analysis, machineries, airworthiness, airframes, avionics, materials, tests, documentation, safety, health and tools etc.
4. Level	4
5. Credit	2
6. Competency	<p style="text-align: center;"><u>Performance Requirement</u></p> <p>6.1 Knowledge</p> <ul style="list-style-type: none"> ◆ Able to understand the theory of aeroplane aerodynamics and flight controls <ul style="list-style-type: none"> • Operation and effect Roll control, Pitch control and Yaw control. • Control using elevons, ruddervators. • High lift devices, slots, slats, flaps, flaperons. • Drag inducing devices, spoilers, lift dumpers, speed brakes. • Effects of wing fences, saw tooth leading edges. • Boundary layer control using, vortex generators, stall wedges or leading edge devices. • Operation and effect of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels. ◆ Able to understand the theory of high speed flight

- ◆ Able to understand the general concept of the airframe structures
 - Airworthiness requirements for structural strength.
 - Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments.
- ◆ Able to understand the aeroplanes airframe structures
 - Fuselage (ATA 52/53/56)
 - Wings (ATA 57)
 - Stabilisers (ATA 55)
 - Flight control surfaces (ATA 55/57)
 - Nacelles/Pylons (ATA 54)
- ◆ Able to understand the air conditioning and cabin pressurisation (ATA 21)
 - Air supply
 - Air conditioning
 - Pressurisation
 - Safety and warning devices
- ◆ Able to understand the Instruments/Avionic Systems
 - Instrument Systems (ATA 31)
 - Avionic Systems
- ◆ 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)
 - Emergency equipment requirements.
 - Cabin lay-out.
- ◆ Able to understand the fire protection (ATA 26)
 - Fire and smoke detection and warning systems.
 - Fire extinguishing systems.
 - System tests.
- ◆ 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,
 - electrical, fly-by-wire.
 - Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks.
 - Balancing and rigging.
 - Stall protection system.
- ◆ Able to understand the fuel systems (ATA 28)
 - System lay-out.
 - Fuel tanks.
 - Supply systems.

- Dumping, venting and draining.
- Cross-feed and transfer, Indications and warnings.
- Refuelling and defuelling.
- Longitudinal balance fuel systems.
- ◆ Able to understand the hydraulic power (ATA 29)
 - System lay-out.
 - Hydraulic fluids.
 - Hydraulic reservoirs and accumulators.
 - Pressure generation: electric, mechanical, pneumatic.
 - Emergency pressure generation.
 - Pressure Control.
 - Power distribution.
 - Indication and warning systems.
 - Interface with other systems.
- ◆ Able to understand the ice and rain protection (ATA 30)
 - Ice formation, classification and detection.
 - Anti-icing systems: electrical, hot air and chemical.
 - De-icing systems: electrical, pneumatic and chemical.
 - Rain repellent and removal.
 - Probe and drain heating.
- ◆ Able to understand the landing gear (ATA 32)
 - Construction, shock absorbing.
 - Extension and retraction systems: normal and emergency.
 - Indications and warning.

- Wheels, brakes, antiskid and autobraking.
- Tyres.
- Steering.
- ◆ Able to understand the lights system (ATA 33)
 - External: navigation, anti-collision, landing, taxiing, ice.
 - Internal: cabin, cockpit, cargo.
 - Emergency.
- ◆ Able to understand the oxygen system (ATA 35)
 - System lay-out: cockpit, cabin.
 - Sources, storage, charging and distribution.
 - Supply regulation.
 - Indications and warnings.
- ◆ Able to understand the pneumatic/vacuum (ATA 36)
 - System lay-out.
 - Sources: engine / APU, compressors, reservoirs,
 - ground supply.
 - Pressure control.
 - Distribution.
 - Indications and warnings.
 - Interfaces with other systems.
- ◆ Able to understand the Water/Waste (ATA 38)
 - Water system lay-out, supply, distribution, servicing and draining.
 - Toilet system lay-out, flushing and servicing.
 - Corrosion aspects.

	<ul style="list-style-type: none"> ◆ Able to understand the On Board Maintenance Systems (ATA 45) <ul style="list-style-type: none"> • Central maintenance computers. • Data loading system. • Electronic library system. • Printing. • Structure monitoring (damage tolerance monitoring). <p>6.2 Theoretical and practical aspects</p> <ul style="list-style-type: none"> ◆ Able to apply the following knowledge in the aircraft maintenance. <ul style="list-style-type: none"> • Airworthiness requirements for structural strength • Emergency equipment requirements • Landing gear (ATA 32) • Lights (ATA 33) • Water/Waste (ATA 38) <p>6.3 Professional approach</p> <ul style="list-style-type: none"> ◆ Able to understand the principal elements of the subjects. ◆ Able to understand the general knowledge of the theoretical and practical aspects of the following subjects. <ul style="list-style-type: none"> • Airworthiness requirements for structural strength • Emergency equipment requirements • Landing gear (ATA 32) • Lights (ATA 33) • Water/Waste (ATA 38) ◆ Able to apply the knowledge in the aircraft maintenance task.
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<p>7. Assessment Criteria</p>	<p>The integral outcomes requirement of this UoC are:</p> <ul style="list-style-type: none"> (i) Able to understand the theoretical fundamentals of the subjects. (ii) Able to give a general description of the subjects using, as appropriate, typical examples. (iii) Able to use mathematical formulae in conjunction with physical laws describing the subjects. (iv) Able to read and understand sketches, drawings and schematics describing the subjects. (v) Able to apply the knowledge in a practical manner using detailed procedures.
<p>8. Remarks</p>	<p>Ref: HKAR-66 Module 11: Aeroplane aerodynamics, structures and systems</p>