

STATUTORY INSTRUMENTS SUPPLEMENT

to The Uganda Gazette No. 50, Volume CXV, dated 12th August, 2022

Printed by UPPC, Entebbe, by Order of the Government.

S T A T U T O R Y I N S T R U M E N T S

2022 No. 88.

**THE CIVIL AVIATION (PERSONNEL LICENSING) (AIRCRAFT
MAINTENANCE ENGINEER'S LICENCE) REGULATIONS, 2022**

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KNOWLEDGE AND SKILL REQUIREMENTS FOR AIRCRAFT MAINTENANCE ENGINEER'S LICENSING

STATUTORY INSTRUMENTS

2022 No. 88.

The Civil Aviation (Personnel Licensing) (Aircraft Maintenance Engineer’s Licence) Regulations, 2022

(Under sections 34(2) (c) and 61 of the Civil Aviation Authority Act, Cap. 354)

IN EXERCISE of the powers conferred upon the Minister by section 61 of the Civil Aviation Authority Act, Cap. 354, and on the recommendation of the Civil Aviation Authority, these Regulations are made this 4th day of May, 2021.

1. Title

These Regulations may be cited as the Civil Aviation (Personnel Licensing) (Aircraft Maintenance Engineer Licence) Regulations, 2022.

2. Commencement

This Instrument shall be deemed to have come into force on the 5th day of February, 2020.

3. Interpretation

In these Regulations, unless the context otherwise requires—

“Act” means the Civil Aviation Authority Act, Cap. 354;

“authority” means the Uganda Civil Aviation Authority established under section 3 of the Act.

4. General eligibility requirements

(1) An applicant for a grant of an aircraft maintenance engineer’s licence shall apply to the authority for the licence and shall—

- (a) be at least eighteen years of age;
- (b) demonstrate the ability to read, speak, write and understand the English language;

- (c) have completed an approved training in accordance with the Approved Training Organisation specified under the Civil Aviation (Approved Training Organisations) Regulations, 2022 or approved maintenance programme specified under the Civil Aviation (Approved Maintenance Organisations) Regulations, 2022;
- (d) comply with the knowledge, experience and competency requirements prescribed for the rating sought; and
- (e) be required to pass all of the prescribed examinations for the rating sought, within twelve months preceding the date of filing the application.

(2) A licensed aircraft maintenance engineer who applies for an additional rating shall meet the requirements of regulation 5.

5. Aeronautical knowledge and skill requirements

(1) An applicant for an aircraft maintenance engineer's licence shall demonstrate the level of knowledge and skill in the subjects as provided in the Schedule to these Regulations.

(2) The knowledge test results for an aircraft maintenance engineer's licence shall be valid for twelve months after passing the examination.

6. Experience requirements for licence with or without type rating

(1) Except as specified in subregulation (2), an applicant for the issuance or extension of a licence in categories A, C, X and R shall show confirmed minimum specific periods of aircraft maintenance engineering experience totaling 3 years.

(2) An applicant for Category 'X' – Compass Compensation and Adjustment shall hold a Licence Without Type Ratings in both Categories 'A' and 'C' or 'X' or 'R' and shall have a minimum of six months engineering experience relating to the maintenance of

operating an aircraft in the two years preceding the date of application with a minimum of six compass swings.

(3) An applicant under subregulation (1) shall demonstrate the following minimum experience gained while maintaining and operating an aircraft and not in component workshops or on static or non-flying aircraft—

- (a) for a Category ‘A’ or ‘C’ Licence Without Type Ratings, twenty four months relating to airframe or engine maintenance, twelve months of which shall be in the two years immediately preceding the date of application; or
- (b) for any Category ‘R’ or ‘X’ Licence Without Type Ratings (excluding Category ‘X’ – Compass Compensation and Adjustment), twenty four months related to avionics systems, twelve months of which shall be in the two years immediately preceding the date of application; and
- (c) six months, within the twelve months referred to in paragraphs (a) and (b), relevant to the specific Licence Without Type Ratings for which the application is being made.

(4) Where an applicant for category ‘X’ electrical holds a valid licence which includes both Category ‘A’ and Category ‘C’ Licence Without Type Ratings sub divisions, the experience in subregulation (3) (b) shall not be complied with and the applicant shall need to show only the six months experience relevant to the Licence Without Type Ratings required in subregulation 3(c).

(5) An applicant for a Licence Without Type Ratings in one category who holds a valid licence in another category, the experience under subregulations (3)(a) and (3)(b) may be reduced depending on the total practical experience accumulated while holding that licence and training attended but in any case shall demonstrate the experience requirements of subregulation 3(c).

(6) Any of the periods specified in this regulation may be concurrent.

(7) Subject to subregulation (8), the extension of a licence to include a type rating shall—

- (a) not require a period of general experience additional to that required for the relevant Licence Without Type Ratings, which shall be held before a type rating is granted; and
- (b) require satisfactory record of experience, gained within the three years before the application, appropriate to the type rating sought.

(8) An applicant for a type rating from a holder of a Licence Without Type Ratings which was gained following successful completion of an approved initial course shall show confirmed evidence that he has obtained at least twelve months relevant aircraft engineering experience with an organisation engaged in the maintenance of operational aircraft in addition to that gained during the course.

7. Privileges and limitations

(1) Except as specified in subregulations (4) and (5), a holder of an aircraft maintenance engineer licence may perform or supervise the maintenance, preventive maintenance or modification of or after inspection, approve for return to service, any aircraft, airframe, aircraft engine, propeller, appliance, component or part thereof, for which the holder of an aircraft maintenance engineer's licence is rated, provided the holder has—

- (a) satisfactorily performed the work at an earlier date;
- (b) demonstrated the ability to perform the work to the satisfaction of the authority;
- (c) received training acceptable to the authority on the tasks to be performed;

- (d) performed the work while working under the direct supervision of a holder of an aircraft maintenance engineer's licence or an aviation repair specialist who is appropriately authorised and has—
 - (i) previous experience in the specific operation concerned; or
 - (ii) received training acceptable to the authority on the task to be performed.

(2) Except as specified in subregulations (4) and (5), a holder of an aircraft maintenance engineer's licence with an airframe rating may, after he or she has performed the inspection required by the Civil Aviation (Operation of Aircraft-Commercial Air Transport Aeroplanes) Regulations, 2022, the Civil Aviation (Operation of Aircraft)(Commercial Air Transport)(General Aviation)(Helicopters) Regulations, 2022 and the Civil Aviation (Operation of Aircraft) (General Aviation) (Aeroplanes) Regulations, 2022 on an airframe or any related part or appliance, approve and return the airframe or any related part or appliance to service.

(3) Except as specified in subregulations (4) and (5), a holder of an Aircraft Maintenance Engineer's Licence with an engine rating may perform the inspection required by the Civil Aviation (Operation of Aircraft-Commercial Air Transport Aeroplanes) Regulations, 2022, the Civil Aviation (Operation of Aircraft) (Commercial Air Transport) (General Aviation) (Helicopters) Regulations, 2022 and the Civil Aviation (Operation of Aircraft) (General Aviation) (Aeroplanes) Regulations, 2022 on an engine or propeller or any related part or appliance and approve and return the airframe or any related part or appliance to service.

(4) Except as specified in subregulation (5), a holder of an aircraft maintenance engineer's licence with a radio, electrical instruments, auto-pilot and compass rating may inspect, repair, maintain, function, test and return to service aircraft radio, electrical, instruments and compass systems and components respectively.

(5) A holder of an aircraft maintenance engineer's licence with an airframe, engine or radio, electrical, instruments and compass rating shall not supervise the maintenance, preventive maintenance or modification of or approve and return to service, any aircraft, airframe, engine, propeller, appliance, component or part thereof, for which the holder of an aircraft maintenance engineer's licence is rated unless the holder has satisfactorily performed the work concerned at an earlier date.

(6) Where the authority authorises an approved maintenance organisation to appoint a non-licensed personnel to exercise the privileges of regulation 6 (1) to (5), the person appointed shall meet the requirements specified in regulations 4 and 5.

8. Recency and renewal requirement.

(1) A holder of an aircraft maintenance engineer's licence shall apply for renewal of licence at least two months before the expiry of the licence in a form and manner prescribed by the authority.

(2) A holder of an aircraft maintenance engineer's licence shall perform work comparable with that required for the grant of the licence for periods totaling at least six months during the twenty four months preceding the date of the expiry of the licence.

(3) A person who fails to renew his or her licence after the expiry period may do so within the next twelve months provided that he or she proves that he has been continuously engaged in practical work for the entire extended period.

(4) A person who does not apply for a renewal within the extended period as provided for in subregulation (3) or fails to prove that he or she has continuously been engaged in practical work during that period shall be required to sit for an exam before his or her licence is renewed.

(5) A holder of an aircraft maintenance engineer's licence shall not exercise the privileges of the licence unless the licence is kept valid as prescribed by the authority.

SCHEDULE

Regulation 4(1)

KNOWLEDGE AND SKILL REQUIREMENTS FOR AIRCRAFT MAINTENANCE ENGINEERS LICENSING

1. The subjects relevant to the knowledge and skill requirements for all licence categories specified in regulation 4 are presented in this Schedule in a modular format.
2. The examinations for each category of licence, and its sub-divisions where appropriate, shall be based on a number of the Modules as indicated in the Module/Category relationship set out in the table below.
3. It will be noted that the modular arrangements recognise that major areas of the subjects are common to more than one licence category or its sub-divisions. Therefore, where an existing Licence requires to be extended to include another category or sub-division, those Modules that have been satisfied by previous examinations may be excluded.
4. Each module is numbered and contains a series of syllabus subject headings. Each subject is then further expanded in more detail against 'level numbers' corresponding to Licence Without Type Rating (LWTR) and Type Rating (TR). This expansion of detail provides an indication of the degree/level of knowledge, experience, competence and skill in aeronautical engineering required by the Regulations.
5. There are three level numbers and they are defined as follows -
 - (a) Level 1: General appreciation of principles and familiarization of the subject;
 - (b) Level 2: Comprehension of principles and salient features with a practical ability to assess operational condition; and
 - (c) Level 3: Detailed knowledge of all aspects of the subject.
6. In applying the above levels to the subjects which, in particular relate to aircraft, engines, systems and items of equipment, the following aspects shall be taken into account—
 - (a) theoretical principles;
 - (b) constructional arrangements, functional and design features;
 - (c) maintenance practices; and
 - (d) normal, deteriorated and failed conditions.

**TABLE: MODULE/CATEGORY RELATIONSHIP
MODULAR KNOWLEDGE AND SKILL SUBJECTS FOR
AIRCRAFT MAINTENANCE ENGINEER**

MODULE 1 REGULATIONS

Syllabus Subject	Level	Details	
	WTR	TR	
Maintenance Engineers' Licences & Authorisations	2	-	Civil Aviation Regulations requirements
			Responsibilities: by statutory law and by the need to fly aircraft in a satisfactory condition, i.e. common, civil, or constitutional law
			Penalties – under statutory law and resulting from civil law suits
			Categories - applicability
			Areas and extent of limitations and privileges within categories
			Overlap of category applicability
			Relevant Airworthiness Notices and other Authority guidance manuals
Aircraft Registrations	1	2	International and national registration requirements
			Registration process
Certificate of Airworthiness	1	2	Issue of Certificate of Airworthiness requirements
			Categories of certificate of airworthiness and purpose of flight
			Prototypes, modified prototypes, series aircraft
			Renewal of certificate of airworthiness requirements and process

Maintenance and Maintenance Records and Certification	1	2	Civil Aviation Regulations requirements and other applicable guidance material issued by the Authority
			Maintenance certification: certificate of release to service
			Duplicate inspections
			Contributory certifications and reliance on other documentation and persons
			Certification - acceptance investigation and judgment procedures
			Modification standards, process and recording
			Maintenance records – relevance of previous records
			Maintenance records – requirement to be kept, preservation and production
			Offences in relation to documents and records
			Inspection requirements and Standards' persons authorized
			Build Standards
			Maintenance responsibilities
Aircraft, engine and VP Propeller Log Books	1	2	Civil Aviation Regulations requirements and other applicable guidance material issued by the Authority
			Authority approval: Light aircraft, large aircraft
			Worksheet; technical log
			Data to be entered in technical log books

			Condition reports – e.g. heavy landing checks, defect investigations, NDT and other inspections, mandatory and non-mandatory
			Maintenance checks and inspections
			Cross-reference to other files/records
			Preservation of documents; Civil Aviation Regulations requirements
Technical log	1	2	Civil Aviation Regulations requirements
			Technical Log – Air Operators Certificate Requirements
Aircraft Documentation and Requirements	1	2	Type certification and supplemental type certification
			Documents to be carried
			Flight manual – provision of manuals and aircraft performance
			Mass Schedule and aircraft loading
			External, and internal markings and signs, e.g. nationality and registration no smoking and fasten seat belt, placards and requirements, doors and exits
			Certificate of Airworthiness
			Certificate of registration
			Air Operators Certificate
			Instrument and Equipments
			Radio Station license and approval
			Change of ownership
			Aerial work, including parachuting, glider towing etc – certification
			Exits and break-in markings

Approvals	-	1	Design organizations
	1	2	Approved maintenance Organization
			Maintenance Schedules/ programmes
			AOC and AMO interface
			100 hours and annual inspections
			Aircraft parts stores requirements and management
Defect Reporting	1	2	Civil Aviation Regulations requirements
			Reportable occurrences (defects, incidents, accidents)
Authority Requirements	1	2	Manual of Airworthiness Requirements
			Airworthiness Notices
			Foreign airworthiness directives
Manufactures requirements	1	2	Service bulletins, manuals service letters etc
Foreign Authorities requirements	1	2	FAA, CAA (UK), JAR
ICAO Annexes requirements	1	2	Annexes 1, 6 and 8

Module 2 Basic Engineering Practices

Syllabus Subject	Level		Detail
	VTR	TR	
Engineering Drawings and Technical Information	1	2	Drawing details-common practices: plan, elevations, isometric, sections, scale, dimensional and indicating presentation
	2	2	Use, validity control, interpretation
	1	2	Maintenance Manuals, Parts Catalogues, Overhaul Manuals
			Service bulletin and modification data
			Maintenance schedules: approved and otherwise
	2	2	Wiring diagram manuals, Interconnection charts, Schematic diagrams, Symbols
Mathematics	1	-	Simple calculations: measurements, angles, graphs, metric/imperial, volume, forces, moments, centre of gravity
			Transposition of formulae, Powers of numbers, Binary notation, Simple equations, Conversion of units

			Resolution of forces
	1	-	Pressure/volume/temperature of gases
			Density, specific gravity, Pressure
			Hydraulics: basic principles, liquids in flow and static conditions
			The atmosphere-density/ pressure/temperature/ altitude/ humidity
			Basic principles of motion, acceleration, centrifugal, centripetal forces, friction
			Basic electrical laws, units, power in circuits, Magnetism, circuit calculation
Hangar/Workshop Common Practices and Tools	1	-	Lubrication methods and application
			Hand tools, simple machine tools
			Go/No Go gauges, fits and clearances
	2	2	Crimping tools, hand and hydraulic
	1	-	Precision measuring instruments, Electrical measuring instruments, Circuit testing methods
	2	-	Torque loading

	1	-	Assessment of in service condition of soldered, brazed and welded joints
	1	-	Inhibiting and corrosion protection
			Painting and paint stripping
	1	-	Metal contamination
			Fire protection and safety in and around the workshop/ hangar/ aircraft

			Storage and handling
Common Parts	1	2	Control cables and fittings
			Fastening devices – threaded, riveted and swaged
			V-band clamps and couplings
			Locking: parts and methods
			Washers
			Bearings
			Pipes: rigid and flexible
			Keys and key ways
			Worm drive and other types of band clips
Gases and Compounds	1	2	Air, nitrogen, carbon dioxide, oxygen, helium
			Acetylene
			Safety aspects
			Adhesives, oils, greases, sealing compounds, solvent
Basic Electrics	2	-	General principles and practices
	2		Simple circuits a.c. to d.c., d.c. to a.c., a.c. to a.c. conversion
	1	2	Ground services ac and dc
			Batteries, application and handling
			Insulators and Insulation, Conductors and conductivity
			Common items used in aircraft applications, e.g. resistors, potentiometers, solenoids

			Transformers, single phase and auto
			Semi-conductors, capacitors, relays
			Micro switches
			Proximity detectors
			Fuses, circuit breakers

			Motors/actuators
			Principles of frequency wild, constant frequency a.c. power
	1		Circuit wiring, connectors, crimping, clipping, cable sizes and types, cable looms, harnesses, terminations and disconnects
			Bonding, earthing of aircraft
	1		Static electricity; lightning; static charges; 'interference' effects on radio equipment, electrostatic damage protection
Environmental Aspects	1	2	Effects of snow, ice, lightning and turbulence

Module 3 Category ‘A’ Common – Aeroplanes, Rotorcraft and Airships

Syllabus Subject	Level		Detail
	WTR	TR	
Basic Aerofoil Theory	1	2	Lift/thrust/drag/weight
			Stalling of an aerofoil
			Induced and parasitic drag
			Boundary layer
			Aerofoil shapes
			Chord/span/aspect ratio
Sub-Structures	1	2	Folded metal, sheet metal, extrusions, tubing
			Effect of swaging, lightening holes
			Use of different metals
			Commonly used fasteners and joint methods
			Protective treatments and precautions
			Honeycomb
			Reinforced plastic or epoxy materials, applications
Floors			

			Seats – crew, passenger – ‘crash’ situation
			Aerials, Pilot probes, drain masts, air intakes and similar structural fitments.
			Instrument panels and consoles
			Radio equipment racks and stowages
Metals	1	-	Light alloys, iron and steel
	1	2	Titanium
	1	-	Brass, bronze, copper, lead
	1	2	Recognition and general characteristics of metals used
			Application and use of metals
			The purpose of heat treatments
			Use of different heat treated materials
			Anodic treatments
			Corrosion treatments during manufacture
			Identification of corrosion
	2	2	Corrosion treatments during repair
			Fatigue
			Other protective treatments or finishes
Non-destructive Condition-Testing	1	-	Typical uses and display of defects using:
			X ray/gamma ray, ultrasonic, eddy current, magnetic particle
	2	-	Penetrant leaching
	1	2	Visual probes
			Eyeglass equipment: usefulness, effectiveness of various magnifications

Materials – non Metal Reinforced Plastics/ Epoxy Composites	1	2	Glass, fibre and filament reinforcement
			Materials used
			Cold setting, hot setting systems

			Construction principles used, aircraft applications
			Failure characteristics
			Honeycomb, foam sandwich
Hydraulic	2	-	Simple systems, i.e. powered pump, reverse selection, pressure relief, pressure regulation LP AND HP filters
	1	2	Types of pump
			Differing fluids – mineral/fire resistant
			Control and indication methods
Landing Gear and Brakes	1	2	Wheels, tyres, shock absorbers, castering, steering methods
	2	-	Simple hydraulic brakes, i.e. master cylinder to wheel-brake unit
	1	2	Brake discs and callipers
	1	-	Landing and braking energy conversion
Electrical	1	2	Simpler type systems
	1	2	Batteries, generators, relays, wiring, switch gear
			Voltage control
			Current limiting, circuit protection devices
			Paralleling
			a.c. from inverters
			Crimping

			Soldered joints
			Control and indications, magnetic indicators and annunciators
Instruments (other than Engines)	1	2	Pitot or static systems and associated instruments
			Gyro instruments – vacuum, pressure, or electrical
			Pressure and temperature Indication
			Position indication

			Compasses
Radio	1	-	VHF communication systems
Safety Equipment	1	2	Fire extinguishers – hand
			Life jackets
			Life rafts
			Seat belts or harnesses-passenger or crew 3-point, 4-point, inertial, lapstraps
	-	3	Mandatory requirements for upper torso restraint
Ground Handling	1	1	Jacking, trestling, slinging, towing, tie down
			‘Servicing’ activities
			Storage
			Painting – protective finish or external markings
	1	2	Weighing and centre of gravity determination – weighing report
			Civil Aviation Requirements e.g. Airworthiness Notices, manual of Airworthiness Requirements
			Scale position
			Basic Weight
			Unusable fuel
			Oil and other consumable liquids - quantities
			Role variations
			Hold, seat row, removable equipment
			Station identification
			C of G datum

MODULE 4(A)

CATEGORY ‘A’ – AEROPLANES

Syllabus Subject	Level		Details
	WTR	TR	
Theory of Flight and Control	1	2	Stability and control
			Equilibrium
			Stalling of the aircraft

			Flaps and slats
			Aerodynamic balance
			Mass balance
			Aileron, elevator, rudder control
			Tabs – servo/anti-servo, balance, anti- balance, trim or spring
			Canard or foreplanes
Aircraft Structures	1	2	Main structures - fuselage or wing
			Stressed skin – diaphragms and longerons
			Tubular structures
			Skin, frames, and stiffening
			Wing: spar and rib structures
			Integral fuel tanks
			Load paths
			Empennage
			Windows, doors and hatches
Refurbish/'Overhaul' of Aircraft	1	2	Preparation of the aircraft– cleaning, access dismantling, jacking and trestling, furnishing removal

			Preparation of inspection reports and establishment of work required
			Final inspection – preparation of final reports and records/log book entries
			Mandatory modifications, Inspections, Service bulletins, Airworthiness Directives applicable to the type rating sought
Overhaul/Repair of Parts/ components	1	2	Overhaul data – requirements, documentation, work sheets, inspection stages, testing
			Use and control of workshop inspection aids including non- destructive test equipment

			Factors and limitations affecting choice of equipment and methods used
			Overhaul and testing procedures for component parts of pneumatic, hydraulic, air conditions, oxygen, anti-icing, de-icing, fire extinguishing and rotorcraft transmission systems
			Assembly procedures and approved repair schemes applicable to major components
			Engine mounting structures
			Inspections necessary before, during and after repair, including checking of alignment and symmetry
			Repair, inspection and testing of tanks, heat exchangers, fuel and oil systems, and all types of control systems relevant to the Licence category sought
Facilities	1	2	Preparation and layout of workshops
			Care, use and checking for accuracy of test equipment
Welding	1	2	Use and application
			Approved welders – limitations, periodic testing
			Supporting – pre-heating – pressure relief
			Cleaning and preparation
			Fluxes and filler or welding rods
			Gas and specialist welding principles
			Materials

			Strength of welded joints
			Inspection before, during and after welding
			Pre-and post-treatments
			Equipment

Brazing/hard Soldering	1	2	Use and application
			Support, pre-heating, pressure relief
			Cleaning and preparation
			Fluxes – fillers/spelter
			Materials
			Equipment
Materials – non Metal:			
(1) Wood	-	2	Types, application and uses
			Diseases – environmental effects
			Plywoods
			Glues – past and present
			Storage and condition control
			Damage-failure modes
			Painting/protective finishes
(2) Fabrics	-	2	Natural and man-made materials – types, applications and used
	-	1	Techniques used during covering
	-	2	Repairs
			Paint finishes and protective treatments
			Butrate and nitrate paints
			Ageing
			Tautening, heat shrinking

			Strength considerations
			Drainage and apertures
			Stitching, stringing, adhesives
			Testing
Systems:			
(1) Flight Controls	1	2	Aileron, elevator rudder
			Operating systems and surfaces – manually operated
			Trim operating systems and surfaces – manual and electric
			Flap systems – electrical, hydraulic and manual
	-	2	Flap systems – pneumatic

	1	2	Simple asymmetric protection
			Slat systems – automatic, and manual
	-	2	Hydraulic
	1	2	Tab systems – trim, balance, servo, anti- servo, anti-balance, spring servo
			Stall sensing and warning – simple systems, e.g. vane or reed types
			Basic auto pilots – simple systems
			Inputs into main controls-function testing – attitude, heading and height sensing
(2) Ice and Rain Protection	1	2	Liquid, electric and boot systems
			Power source, control and indication
			Windscreen wipers

	-	2	Electrically-heated wind-screens
(3) Heating and Ventilation	1	2	Combustion heaters, exhaust heat exchangers
			Ram air
			Ventilation fans
(4) Oxygen	1	2	Bottle storage, distribution, regulation
			Masks
	2	-	Safety features and requirements
(5) Pressurisation	1	2	Simple systems – bleed air, turbo-charger bleed
			Passenger environmental requirements for the control of: oxygen, heating, ventilation, rate of change, humidity
			Mass flow control
	1	2	Temperature control
			Differential pressure – maximum, negative
			Control and indication
			Cabin structure, windows and doors for pressurised flight
(6) Vacuum/Pressure	1	2	Dry and wet pump systems
			Oil separation
			Gyro supply
			Relief valve
			Filtering
			Aerofoil anti-icing
(7) Pneumatic	-	2	Landing gear or flaps/brakes
			Operating systems
			Basic theory and common practices

MODULE 4(B)

CATEGORY ‘A’ – AEROPLANES

Syllabus Subject	Level		Details
	WTR	TR	
Theory of Flight and Control	1	2	Transonic effects, swept wings, wing fences, spoilers, high lift devices vortex generators
			High speed stall
			Shock wave
			Speed of sound-mach numbers
			Work turbulence
	-	2	Supersonics – sound waves
			Delta wing forms
			Kinetic heating
			C of G control
		1	2
Aircraft Structures			Management systems – general principle
	1	2	Fail-safe application
			Fatigue effects and control
			Wing: box or integral tank construction
			Pressure-loaded skin, bulk-heads, windows, windscreens, doors
			Milling or chemical etch constructed structure
			Bonded type construction
		Fasteners-close tolerance	
		Sealing compounds	
		Maintenance programmes-structural survey	

			NDT programme
			Large aircraft paint and protective Finishing processes
			Cargo holds
			Venting and draining
			Sound proofing
M			
Furnishings	1	1	Upholstery
			Toilet and galley partitioning
			Carpets and Curtains
			Particle boards and plastic laminates
	1	2	Fire resistance/escape requirements
			Passenger seats
			Crew seats – cabin and flight crew
Systems:			
(1) Flight Control	1	2	Powered controls
			Spoiler, air or speed brake, lift dump
			Lift augmentation-LE droop, slats or flaps
			Flap operating systems – large transport aircraft
			Flap asymmetric and alternate operation
			Stall sensing-stick shake
	-	2	Stick push/nudge
	-	1	Electronic control system
	1	1	Fly by wire

(2) Hydraulic	1	2	Variable delivery systems
			Accumulator or cut-out dependent system
			Pressure or volume control
			Pressure-reducing valves
			Fire-resistant fluids-temperature, contamination, compatibility
			Pressurised reservoirs
			Multiple system provision
			Alternate systems-HYRAT or hyd-raulic motors
			Electrically-powered and air-driven systems
			Leak protection systems – system isolation, ‘fused’ systems, priority control
			Internal leakage – cause and effects –acceptability
(3) Landing Gear	1	2	Multiple axles and wheels
			Bogey beams
			Door sequencing
			Main and alternate brake provision
			Anti-skid system-electronic and mechanical-aquaplaning
			Landing gear unsafe protection
			Alternate lowering
			Weight on or weight off sensing
			Fire protection
			Powered steering–retraction self centring
	-	2	Auto braking
(4) Pneumatic (ATA 36)	1	2	Bleed air pneumatic systems
			Systems supplied

			Bleed air valves
			Mass, flow, pressure and temperature control and indication
			Ducting
			Leak detection
			Alternate supply-APU and ground cart
(5) Ice and Rain Protection	1	2	Mainplane or tail hot air anti-ice systems
			Control and indication
			Leak/overheat-detection or protection
	1	2	Ice detection
			Rain repellent
			Windscreen wipers
			Laminated windscreen heating
			Waste water discharge
			Pilot/static sensors
(6) Environmental and passenger Systems: -			
6.1 Air Conditioning	1	2	Cabin blower or bleed air supply
			Heat exchangers
			Cold air units or air cycle machines
			Vapour cycle systems
			Humidity control systems
			Mass, flow, pressure and temperature control and indication
			Leakage detection and protection
			Ventilation requirements
			Passenger service unit air supply
			Water extraction

			Recirculation
6.2 Pressurisation	1	2	Outflow control - electric, electronic and pneumatic
			Maximum differential and negative pressure control
			Cabin altitude and rate of change
			Emergency dump and manual control
			Ditching
			Cabin altitude and rate of change
			Entrance or access or baggage door sealing and locking, indications and warnings
6.3 Oxygen	1	2	Storage, distribution and charging
			Drop-out system
			Chemical systems
			Therapeutic provision
			Masks – passenger or crew or smoke
	1	3	Bottle checks and precautions
6.4 Toilets, Waste and Water, Galley Services	1	1	Toilets: servicing provision
	1	2	Toilet flushing systems – pump over – heat protection
			Water – washing, hot or cold, potable
			Potable water – health protection
			Pressure control
			Water heating systems – safety provisions
			Waste collection and drainage
			Galleys-refrigerators, food and drink, ice – health protection
			Lifts, safety factors
			Catering trolleys

6.5 Baggage	1	2	Automatic systems-pallets and containers
			Restraint and securing
			Dangerous goods
6.6 Entertainment and Passenger service	1	1	Films, video, television and audio
			Public address
(7) Electrical	1	1	3-phase a.c. power generation systems - Control and protection Transformer rectifier units Cables and terminators
			Basic electronics-hardware – printed circuit boards
			Built-in testing provisions
			Static inverters
	-	1	Multiplex – basic principles
	1	1	Logic – basic principles
(8) Instruments	1	1	ADI, HSI representation and ground functioning
			Altitude encoding and transponder systems – general
			Computer inputs
			Centralised air data units
			CRT displays
			Flight recorders – voice recorders
			INS
(9) Equipment, Safety	1	2	Slide, rafts, dinghies
			Portable oxygen
			Loud hailers
			Smoke masks or hoods
			Survival equipment
			Notices or placards

Module 6 Category ‘C’ –Piston Engines in Aeroplanes, Rotorcraft and Airships

Syllabus Subject	Level		Details
	WTR	TR	
Principles, Terminology			
Definitions and Laws	1	2	Normally aspirated and super-charged operation
			Two and four stroke cycles
			Ignition timing, mixture, fuel grade detonation.
			Power
			Overhaul periods or continuation in service beyond overhaul recommendation
			Ground running – principles and problems
			Effect of altitude, humidity, temperature and icing
			Standard atmosphere, pressure altitude
			Fixed and variable pitch propeller effects
			Vibration characteristics and damping
			Type certification
Engine overhaul: General	2	-	Overhaul as a condition control process – its advantages and disadvantages
			Familiarity with the operating environment of piston engines in aircraft
			Sudden stoppage – over-revving, over-boosting, over-heating
			Bogus parts

			Fatigue
			Mandatory reporting
			Fuels and oils – Mogas
Overhaul Process Control	2	-	Facilities: shop layout – stores; work environment; equipment for cleaning, inspection, rework and testing
			Control of precision measuring instruments and equipment
			Work package control and processing
			Acceptability of third party work/opinions/reports/recommendations e.g. manufacturers and their agents/other agencies
			Use of experts and expert opinion
			Use of unskilled labour
Constructional Arrangement and Piston Engine General Consideration	1	1	General arrangement – internal
	1	2	General arrangement - external
			Crankcase breathing
			Propeller shaft sealing
			Propeller attachment provision material
			Power take-off provision
			Cooling
			Cylinders, pistons and valve gear
			Hydraulic tappets
			Camshaft
			Casings, mountings and accessories drive

			Vibration damping
			Crankshaft, balance weights, main bearings
			Auxiliary drives, internal lubrication provisions
			Seals and sealing materials
			Oil coolers and thermostatic valves
			Oil pumps, filtering, pressure control
			Fuel pumps – engine driven
			Ignition and valve timing provision
			Drive pulleys
			Hardness testing, fits and clearances Dowels and blind holes
			Sequential torque assembly– retorquing requirements
			Tooth patterns and backlash checks
			Contact area checking
			End float clearance, checking and setting
			Bonding and main earthing
Repairs and rectification	1	1	Machining
			Heat treatment
			Anodic treatments
			Plating
			Corrosion treatments
	2	2	Protective treatments and finishes
			Surface finishes

			Fits and clearances
			Thread forms
Overhaul activity	1	2	Cylinder and piston assemblies
			Cooling baffles – hottest cylinder
			Main casings
			Rear covers
			Gear trains
			Camshaft and valve operating mechanisms
			Crankshaft,connecting rods–bearings
			Lubrication systems–passages, jets, pumps, pressure relief valves, coolers, thermostatic valves, filters and strainers
			Sealing-slinger rings, and mechanical flow control
			Crank cases, rear covers, sumps
			Engine mounting provisions
			Governor drive provision
			Induction and exhaust manifolds
			Reduction gears, assemblies and housings
			Superchargers or turbochargers
			Carburettor/injection systems
			Hoses and pipes
			Electrical wiring
			Ignition harness
Non-Destructive Testing	2	-	Eddy current, ultrasonic, X-ray or gamma ray, magnetic particle
			Techniques – status and approval

			Approved NDT organisations
			Interpretation of results
			Certification of inspection completion or acceptability of the condition found
Welding/Brazing	2	-	Preparation – flux- welding or brazing es, rods
			Expansion, contraction effects and control
			Hollow parts – internal protection
			Welding methods: gas, arc, resistance welding
			Brazing and hard soldering methods
			Approval of welders
			Inspection of welded or brazed joints
Release, Preservation, Storage and Transportation	2	-	Log Books: certification, reports, references, recording of parts, limits, concessions, modifications, alternate parts, mandatory modifications and inspections
			Service information leaflets, etc
			Lifed parts, salvage schemes or oversized parts
			Inhibiting: internal, external, injectors, carburettors, turbochargers
Systems:			
(1) Carburetor and induction	1	2	Air intake – normal or alternate – filtering
			Manifolds
			Anti-icing provision
			Float type and injection systems
			Engine driven fuel pumps

			Priming systems
			Mixture, idle cut-off or throttle control
(2) Ignition	1	2	Magnetos
			Ignition harness
			Spark plugs – reach variations, operating temperature – long life
			Switch control
			Timing (internal or external)
			Advancing and retarding mechanisms
			Screening
			Starting aids – impulse couplings and ignition boosting
(3) Starting	1	2	Starter motors – manuals, Bendix, solenoid, pre-engaged – engagement methods
			Non-engagement indication and effects
			Starter relays
			Earth straps
			Cooling
			Effects on battery
(4) Fire Protection and Indication	1	2	Extinguishant, bottles, cartridges, ‘life control
			Detection systems and warnings
			Two shot provision
(5) Lubrication	1	2	Wet and dry sump systems
			System arrangement
			Pressure control
			Effects of hot and cold weather
			Filtering

			Straight, detergent, ash dispersant oils
			Engine condition assessment using oil system analysis
			Oil coolers- temperature control
			Hoses, rigid pipes, internal passages, splash – oil jet
			Cooling functions of the oil system
(6) Supercharging/ Turbocharging	1	2	Directly driven and exhaust drive superchargers
			Manual and automatic control
			Lubrication and hydraulic power
			Controls and indication
			Automatic control systems
(7) Aircraft Fuel	1	2	Tanks, cells and integral systems
			Fuel tank heating and monitoring
			Venting
			Fuel pumps – electrical
			Fuel grades and quality
			MOGAS
			Water contamination – drains
			Filtering
			Controls and indication
(8) Engine Controls	1	2	Throttle
			Electronic controls
			Mixture
			Propeller
			Alternate air
			Manual controls for turbocharger

(9) Engine Instruments	1	2	Manifold pressure
			Rotational speed
			Pressure and temperature
			Cylinder head temperature
			Exhaust gas temperature
			Electronic Condition Monitoring
(10) Diagnostic Tools	1	2	Equipment
			Use and analysis

Module 7 Category ‘C’ – Fixed and Variable Pitch Propellers

Syllabus Subject	Level		Details
	WTR	TR	
Principles, Terminology, Definitions and Laws	1	-	Constant Speeding
			Pitch variation
			Ground and flight functioning characteristics
			Power conversion
			Blade forces: aerodynamic and centrifugal
			Aerofoil aerodynamic principles
			Pitch coarse/fine, high/low, reverse
			Feathering
			Vibration characteristics
			Turbine engine installation propeller systems
Constructional Arrangement	1	2	Pitch change mechanism single/double acting
			CSUs or governors
			Spinners
			Balance control
			Materials
			Diameter – minimum and maximum
			Pitch stops – fixed, centrifugal, manual and electrical
			Protective finishes – contour control
	1	3	Damage acceptance areas
			Cropping

	1	2	Attachment and assembly methods
			Oil transfer – governor, propeller or sump
			Safety visibility
Automatic and Manual Pitch Control Systems	1	2	Pilot control and governor sensing
			Feathering
Ice Protection	1	2	Liquid and electrical systems
Turbine Engine Application	1	2	Auto-feathering
			Synchronising or synchrophasing
			Braking
			Automatic and manually controlled pitch limiting systems
			Beta control
			Permitted balancing

Module 8 Category ‘C’ – Turbine Engines in Aeroplanes, Rotorcraft and Airships

Syllabus Subject	Level		Details
	WTR	TR	
Principles, Terminology Definitions and Laws	1	2	Gas flow path – temperature, velocity and pressure
			Compression
			Combustion
			Turbine Power extraction
			Effects of atmospheric variations in temperature, density, pressure altitude on engine and on engine or aircraft combination
			Single shaft, two and three shaft engines
			Centrifugal and axial flow compressors
			Fan engines
			By-pass engines
			Water or water methanol injection
			Power turbines
			Surge or compressor stalling
			Propeller turbines
			Gas producers
			APU applications
			Thrust reversal
			Power assessment
Constructional Arrangement	1	2	Casings, shafts, bearings, accessories drive
			Air intakes and compressors
			Combustion section

			Turbines and exhaust
			Materials
			Modular construction
	1	3	Engine inspection capability and condition assessment provision
	1	3	Principles of ‘condition monitored’ and ‘on condition’ maintenance programmes
	-	2	Supersonic flight air intake geometry control systems
Propeller and Shaft Power Provision	1	2	Gas producers
			Reduction gearing
			Power and auxiliary drive
			Rotational speed and power control, safety systems
	1	1	Principles of torque, power, rotational speed in power transmission by rotating shafts
Systems:			
(1) Thrust Reversing	1	2	General arrangements
			Control/interlocks
			Safety features
			Operating systems – hydraulic/pneumatic mechanical
			Turbine and fan applications
(2) APUs	1	2	General arrangements
			Intake and exhausts systems – door operation
			Load control
			Electrical output control and management
			Speed control

			Fuel control
			Safety features
			Ground, flight or altitude-limiting factors
			Mounting
			Fire protection and indication
			Bay cooling
			Ground running
(3) Fuel Control	1	2	Principles – parameters
			Mechanical or electronic control
			Power speed – control and limiting
			Temperature and power factors
			Burners–primary and secondary provision
	-	2	Burners–shaft injection, torch ignition
	1	2	Governor speed sensing
(4) Fuel Systems	1	2	Tanks – cells and integral systems
			Refueling/defuelling, crossfeed, jettison, venting, transfer
			Scavenging – jet pumps
			Boost pumps, backing pumps
			LP or HP valves and control
			Tank selection
			Internal or external pipes, hoses, connectors
			Fuel types
			Static electricity–effects and control
			Leak assessment and control
			Fuel quantity indication – ‘LevelSticks’

			Water contamination – effects and control
			SG, Density, volume or weight
			Filtering and heating
			Fuel systems in pressurized cabin areas
(5) Water Injection	1	2	Water or water methanol applications
			Sensing, control and safety provision
			Power effects
			Tankage
			Replenishing or dumping
			Pumps
			Effects on fuel control
			Pipes and pipe lines
(6) Lubrication	1	2	Tanks, storage, venting, contents indication
			Pressure or scavenge pumps
			Filters, screens and magnetic plugs/chip detectors
			Pressure or flow control
			Heat exchangers oil, fuel, oil or air
			Sealing-labyrinth seals, carbon seals, etc.
			Overboard drains – drains systems
			Lubrication of mains bearings, accessories and gear trains

			Supply to propeller systems
			Contamination by hydraulic fluid or fuel
			Types of oil
			Internal or external pipes, hoses and passages – effects of heat
			Use of oil for ice protection – intake and fuel control
(7) Cooling, Sealing and Bleed Air Services	1	2	Internal cooling, external cooling, sealing air
			Overboard dump – temperature monitoring
			Off-takes for other services – air conditioning, anti-icing, equipment drive, pressurizing of hydraulic reservoirs, water systems, etc.
			Centrifugal filters
(8) Surge Protection and Airflow Control	1	2	Bleed valves – operating systems
			Variable inlet guide vanes – scheduling, operating systems
			Surge sensing
			‘Surge margins’
	-	2	Supersonic flight air intake geometry control
(9) Ice Protection	1	2	Hot air systems–struts and intakes
			Electrical systems – engine and intakes
			Use of oil and air bleeds
			Pressure sensor heating
			Control and indication
(10) Fire Protection	1	2	Fire detection
			Overheat warning
			Fire extinguishing
			Bay and zone isolation

			Fire walls, bulkheads, cladding
			Fire wires, detector units
			Single/dual detection
			Extinguishants
			First and second shot capability
			Warnings and indications – lights, aural warnings, fuse types, squib test
			‘Bottle gone’ indicators
			Operating systems
			Over pressure
			Cartridges – life control
			Electric and electronic systems
(11) Ignition	1	2	High energy ignition systems
	-	2	Torch ignition
			Glow plug systems
	1	2	Igniter plugs and leads
			Operation inside and outside the starting cycle
(12) Starting	1	2	Starting cycle
			Initiation – HP valves, termination, bleed valves, starter valves, power lever, self sustaining speeds
			Starter motors – electrical, pneumatic, starter/generators – HP air, impingement air
			Clutch provision, overspeed sensing
			Manual operation starter cooling/ resting
			Ground power electrical/ pneumatic provisions
(13) Controls	1	2	Power/throttle/thrust reverse

			HP/LP valve controls – manual and electric
			Condition control systems
			Propeller control
			Auto control of throttle
			Control runs
	-	1	Electronic control systems
(14) Pods, Pylons, Cowlings and Mountings	1	2	General arrangements
			Services and controls – input/exit
			Materials
			Venting
			Zone demarcation
			Mountings
			Pylon and pod structural features
			Torque, vibration, expansion provisions
			Bay venting
			Cooling air intakes
(15) Electrical	1	2	a.c. generators – CSDs/IDGs
			Starter/generators
			Starter motor high current circuits
			CSDs – principles of operation, disconnect/ reconnect, lubrication/ hydraulic operation, filters, coolers
(16) Instruments	1	2	Rotational speed indication; a.c. generator and pulse probe systems
			Temperature and pressure systems
			Pressure ratio systems

			Turbine temperature systems
			Instrument system amplifier
			Fuel flow indication
			Torque indication
			Fuel contents/oil contents- electrical and electronic
			Vibration indication
Ground Handling	1	2	Storage and inhibiting
			Spare engine carriage
			Ground running – noise control –power checking
			Functional checks of engine associated services

Module 9 Category ‘A’ & ‘C’–Rotorcraft

Syllabus Subject	Level		Details
	WTR	TR	
Theory of and Flight Control	1	2	Rotor disc: forces acting, lift, drag centrifugal force, weight, rotor useful force, phase lag; advance angle non- constant speed drive (Hookes Joint) effect
			Articulate/ semi-rigid/ rigid rotors
			Flapping/ dragging/ feathering
			Climbing/losing height/ horizontal flight
			Main and anti-torque rotors– control inputs–cyclic and collective
			Effects of aircraft speed on rotors
			Directional control
			Translational lift/inflow/ground effect
			Vortex ring effect
			Retreating blade stall
			Reverse flow
			Auto-rotation; auto-rotative force/ blade section
			Auto-rotation rev/min
-	2	Twin rotors	
Constructional Arrangements	1	2	Rotorcraft structures, load paths, vibration effects
			Landing gear configurations: skids/ wheels/ floats
			Fuselages, tail cones, pylons, engine mounts
			Gearbox and transmission mountings
			Doors and windows

Systems:			
(1) Flying Controls	1	2	Collective/cyclic/directional
			Hydraulic
			Rotor heads – main and tail rotor
	1	2	Articulated, rigid, semi-rigid, teetering
			Swash plate/spider control input methods
			Blades: construction and materials; balancing: static, dynamic, span wise, chord wise
			Tracking: flag and in-flight methods
			Tabs/trailing edge bending
			Vibration – effects and analysis
			BIM indicators
			Automatic Pilots/Autostabilisers –Control interface
			System components – component replacement and subsequent testing
(2) Ice and Raid Protection	1	2	Windscreen wipers
			Electrically-heated windscreens
(3) Heating and Ventilation	1	2	Exhaust heat exchangers
			Ram air
			Ventilation fans
Transmission systems	1	2	Engines to rotors: shafts, clutches, freewheel units; reduction gearboxes; main transmission/ gearboxes, combining gearboxes

			Tail rotor drive: drive shafts, intermediate gearboxes, tail rotor gearboxes
			Lubrication systems: oils, coolers, cooling fans, filters, magnetic plugs, chip detectors, pumps, pressure control

			Universal drive provision
			Splined shafts, type of gears – tooth pattern
			Instrumentation
			Rotor brake systems
Equipment	1	2	Hoists and winches
			External load carrying
			Flotation
			Survival systems
			Specialised role equipments, aerial spraying, cameras
Instruments	1	1	ADI, HIS
			Flight recorders
	1	2	HUMs

Module 10 Category ‘A’ & ‘C’– Airships

Syllabus Subject	Level		Details
	WTR	TR	
Principles of Lift	1	-	Bodies immersed in fluids
			Gases: free to expand/constant volume/constant temperature/constant pressure
			Mixture of gases in a containing vessel
	2	-	Centre of gravity, centre of buoyancy, static heaviness, static lightness, static trim
			Ballonet ceiling, pressure height
			Superpressure
			Superpressure, superheat
			Porosity
			Equilibrium
			Ballast-shot/water
Theory of Flight and Control	1	-	Aerodynamic lift, aerodynamic balance
			Stability and control
			Free ballooning
			Fins, rudders, elevators
			Tabs: balance/servo/trim/spring
			Powered flying controls
Envelope	2	-	Materials: fabrics, Kevlar
	1	-	Ultra-violet light effects
			Gas-tight membranes
			Ballonets, gases, load curtains, shear curtains, support cables, gas valves, air valves, entry ports, inspection domes, charge adaptors, load patches, handling lines, nose cone
			Charging, purging, porosity checks

			Lightning protection
			Airs systems: ram air scoops, balloonet fans, dampers, transfer fans
Gondola	2	-	Main Structures
			Materials: Kevlar laminate, fibrelam, sandwich panels, metal skin frames and stiffening
	1	-	Moulding/bonding techniques
			Support cables, support cable attachment, bulkheads, equipment attachment
			Furnishings
			Doors, windows and hatches
			Fire protection – skinning
			Lightning protection
Systems:			
(1) Flight control	1	-	Fins, rudders, elevators
			Operating systems and surfaces –manually/power operated
			Trim operating systems – manual and electric
(2) Ice and Rain Protection	1	-	Windscreen wipers
(3) Heating and Ventilation	1	-	Exhaust heat exchanges
			Ventilation system
(4) Vacuum/Pressure	1	-	Supply and associated system
(5) Landing Gear	1	-	Geometric arrangement
			Structural arrangement
			Castering/pivoting/locking
			Shock absorbers
			Weight sensing/measurement
Ducted Propellers	1	-	Principles of operation

			Propeller forces: aerodynamic/centrifugal
			Pitch variation/control
			Positive/negative vectoring
			Power conversion
			Control systems: electronic control, emergency forward coarse selection
			Balance
			Clutches
			Materials
			Protective finish: contour control, visibility
			Duct pivoting systems: drive and control, motors, limit control, gear boxes, inter-connection, emergency manual
Ground Handling	1	-	Attaching to/releasing from/mast
			Ground power
			Fuelling
			Ballasting
			Helium: charging, purifying, leak testing
			Pressure watch techniques
			Mooring – mobile/portable
			Engine running
			Hangaring
			Adverse weather

Module 13 Human Performance

Syllabus Subject	Level		Details
	WTR	TR	
General	2		The need to take human factors into account
			Incidents attributable to human factors/ human error
			'Murphy's' Law
Human Performance and Limitations	2		Vision
			Hearing
			Information processing
			Attention and perception
			Memory
			Claustrophobia and physical access
Social Psychology	1		Responsibility: individual and group Motivation and de-motivation
			Peer pressure
			'Culture' issues
			Team working
			Management, supervision and leadership
Factors Affecting Performance	2		Fitness/health
			Stress: domestic and work related
			Time pressure and deadlines
			Workload: overload and underload
			Sleep and fatigue, shiftwork
			Alcohol, medication, drug abuse
Physical Environment	1		Noise and fumes

			Illumination
			Climate and temperature
			Motion and vibration
			Working environment
Tasks	1		Physical work
			Repetitive tasks

			Visual inspection
			Complex systems
Communication	2		Within and between teams
			Work logging and recording
			Keeping up to date, currency
			Dissemination of information
Human Error	2		Error models and theories
			Types of error in maintenance tasks
			Implications of errors (i.e. accidents)
			Avoiding and managing errors
Hazards in the Workplace	2		Recognizing and avoiding hazards
			Dealing with emergencies

Module 21 Basic: Electrical Equipment and Systems

Syllabus Subject	Level		Details
	WTR	TR	
Batteries	1	-	Principles of primary and secondary cells
	2	-	Lead-acid types
			Ni-Cad types
	2	3	Methods of charging batteries in aircraft
	2	-	Capacity testing, storage
Direct Current Machines	2	-	Basic laws and principles
			Types and characteristics
			Control
Direct Current Generation	1	2	Voltage regulation
			Control
			Load sharing
			Paralleling
			System layout
			Interlock circuits

Power Conversion Equipment	1	2	Static and rotary inverters
			Transformer rectifier units
Fire Protection	1	2	Detection systems
			Fire and overheat warning
			Smoke detectors – principles and applications
			Overheat sensors
			Extinguishing systems
			Warnings

Flight Controls	1	2	Motors and actuators – clutches and brakes
			Limit switches, micro switches and proximity detectors
			Power control units
			Flap motors protection and control
			Trim motors
Fuel Systems	1	2	Boost pumps control and indication
			Jettison systems
			Refuel/defuel systems
			Fuel heaters
			Crossfeed, supply and shut-off valves-normal and emergency
Hydraulic Systems	1	2	Pump control and isolation
			Pressure switches
			Overheat warnings
			Electrically-operated priority valves
			Fluid reservoir components
			Low level warnings
Landing Gear Systems	1	2	Actuation motors – selection and control
			Indication – proximity sensors microswitches
			Air/ground sensor systems
			Anti-skid systems – operation, control and override
			Automatic braking systems – inputs; control and override
Lighting Systems	1	2	External systems: landing, navigation, anti-collision and inspection, etc.

			Internal systems: normal and emergency, fluorescent tubes, reading and passenger information systems, multiplex function
Pneumatics	1	2	Control–indication and protection
Engine and Propeller Control	1	2	Fuel control valves
			Temperature and speed limiting systems
			Propeller feathering controls
			Electronic engine control
Starting and Ignition	1	2	System types
			Control
			Principles of operation of high energy ignition units
			Aircraft and engine applications and related systems, e.g. stall warning
Alternating Current Machines	2	-	Basic laws and principles
			Types and characteristics
			Control
Alternating Current Power Generation	1	2	Constant and variable frequency
			Constant speed drive units
			Paralleling
			Load sharing
			Load shedding
			Generator control unit
			Voltage regulation
			Load controller
			Differential protection

			Fau
			Vol tag

Alternating Current Power Distribution Systems	1	2	Bus-bar layouts
			Split and parallel systems
			Transfer relay interlocks
			Emergency conditions
			APU and GPU interlocks
			Warnings
			Maintenance panels
Air Conditioning Systems	1	2	Control
			Indication
			Protection
Ice and Rain Protection Systems	1	2	Windscreen heating: control, indication and failure
			Engine/propeller and airframe anti-ice protection: thermal, electrical and pneumatic
			Warnings and indications
			Overhead indications and protection
			Ground operations
			Windscreen wiper, washer and rain repellent systems
			Sensor protection – angle of airflow, pitot head, static plate and temperature probes
			Waster water heaters – thermal anti-icing protection
			Aerial heaters

Auxiliary Power Units	1	2	Starting, control, protection
			Power generation
			Fire protection
Ground Power Supplies	-	2	Interlocks and protection of aircraft supplies
			Control
Centralised Warning and Indication Systems	1	2	Inputs
			Output warnings
			Priority philosophy
Galley/Toilet Services	1	-	Power supply and protection
			Water heating
			Equipment

Module 22 Basic: Instruments Category ‘X’

Syllabus Subject	Level		Details
	WTR	TR	
Pitot-Static Systems and Instruments	1	-	Atmospheric physics, temperature lapse rate, Mach number computation
	2	-	Airspeed indicator, altimeter, vertical speed indicator, and machmeter
			Servo altimeter
	1	2	Pitot probes, static plates and heaters
	2	2	Pipelines and flexible hoses
	1	2	Drain straps, associated equipment
			Altitude and airspeed switches
Rate of Turn and Slip Indication	1	2	Rotor speed; display
Vacuum System	1	-	Sources

	1	2	Control and adjustment
			Indication
Pressure Measurement	1	-	Sensing elements; capsules, bellows, Bourdon tubes, transmitters
			Displays

Temperature Measurements	1	2	Variable resistance
			Thermocouplers; compensation, limits and values; servo indicators; control system inputs
Rotational Speed Measurement	1	2	Direct drive indicators; tacho-generator and indicator systems; pulse probe systems
			Displays
Position Measurement	1	2	d.c. and a.c. systems
Quantity Measurement	1	2	Direct reading
	2	2	Electrical and electronic systems
	1	2	Compensation
			Power supplies
Flow Measurement	1	2	Indicators
			Transmitters
			Power supplies
Compasses	1	2	Direct reading compass installation; safe distance
			Flux detectors and remote sensors remote system components
			Heading reference outputs
Air Data Computation	2	-	Sensors and inputs
			Signal processor: mechanical, electrical and electronic
			Signal outputs and displays

Reduced Vertical Separation Minima	1	2	Signal sources and interface with other systems
	1	2	Maintenance practices
Flight Path Computation	2	2	Signal sources, radio inputs
	1	2	Modes, computation
			Displays
Electronic Display Systems	1	1	CRT; LED; LCD displays
	1	2	EADI; EHSI; symbol generators
			Control panels
			Comparators and monitors

			Engine indicating and crew alerting systems
			Electronic centralised aircraft monitors
Flight Data Recorders	1	2	Requirements
	1	2	Sensors and inputs
			Cockpit Voice Recorder inputs
			Interface with aircraft systems
			Signal processing
			Entry panels
			Computer principles
			Data recording methods
			Retrieval and verification
	1	1	Readout
	1	2	Failure monitors
Inertial Navigation Systems and Inertial Reference Systems	1	1	Basic principles
			Platform construction
			Computation

	1	2	Displays and interface with aircraft equipment
			Mode selector and CDU
			Failure/fault indicators
			Power supplies and cooling
Ground Proximity Warning Systems	2	2	Modes
			Warnings
	1	2	Inputs and interface with other aircraft systems
	1	1	Computation
			Monitors
			Failure indications
Vibration Measurement	1	2	Types of pick up
			Signal conditioning
			Displays
			Alarm levels and warnings

Compass Compensation	1	-	Base survey techniques
			Compass swinging areas
			Aircraft magnetism
			Terrestrial magnetism – variation
			Methods and procedures for swinging compasses
	3	-	Deviation: calculations and effects on a compass
			Compensation and adjustment procedures
Digital Flight Systems	1	1	Flight management systems

Module 23 Basic Gyroscopes and Servomechanisms Category ‘X’

Syllabus Subject	Level		Details
	WTR	TR	
Gyroscopes	1	-	Basic principles
	1	2	Types and methods of operation – vacuum, electrical, or laser
	2	-	Handling care
Electronics	1	2	Transistors
			Biasing, simple circuit arrangements
	1	2	Amplifiers
			Signal amplifiers, feedback
Attitude sensing	1	2	Errors, correction
			Remote gyros, interconnection and transfers
			Limits
Direction sensing	1	2	Errors, compensation
			Remote gyros, interconnection and transfers
Rate sensing	1	2	Alignment
			Rotor speeds
Accelerometers	1	2	Basic principles
Synchros	1	2	CTs, Differential, Torque synchros and resolvers

Servomechanisms	1	2	Rate and position sensing and control
			Integrators
			Response and damping
			Power requirements
			Clutches
			Override and lockout protection

			Null and loop error sensing
			Synchronisation systems
			Force rebalance systems
Digital Techniques	2		Logics – basic gate functions and truth tables
	1		Microprocessors – block diagram
			Digital computing techniques
			Parallel and series operation
			Volatile/non-volatile data storage
		2	Multiplex systems
High Intensity Radiated Fields (HIRF)	1	1	Effect on sensitive systems, principles and methods used to minimize HIRF effects
Fly by Wire	1	1	General principles

Module 24 Automatic Pilots - Aeroplanes Category ‘X’

Syllabus Subject	Level		Details
	WTR	TR	
Theory of Flight (Fixed Wing)	1	2	Forces on the aircraft
			Stability – dihedral, sweepback, etc
			Control axis
			Primary control surfaces – operation and effect on the aircraft
			Secondary controls
			Forces during turns
			Functions of trim tabs, balance tabs and servo tables

			High speed buffet and stall conditions
			Auto-pilot control axis
			Auto-stabilisers – wing levelers
			Co-ordinated turns, aileron/rudder cross feed
			Versine generation and application
			Sideslip monitors – Slip and skid in a turn
			Turbulence penetration and the effect on autopilot control
Yaw Dampers	1	2	Dutch Roll phenomenon
			Yaw sensing
			Yaw signal processing
			Synchronisation
			Series and parallel systems
			Cockpit indication
			Aileron/rudder control interaction in turns
			Rudder PCU, LRUs
			Interlocks with autopilot systems
Pitch Trim Systems	1	2	Longitudinal axis stability
			High speed tuck
			Mach No. inputs
Mach Trim	1	2	Mach trim actuators computation
			Connections with aircraft controls
			Warnings
Alpha Trim	1	2	Angle of attack sensing
			Computation

			Interface with other aircraft systems: e.g. N1 computers – stall warning systems
			Flight directors
Auto-Stabilisers	1	2	Trim actuators – control and safety interlocks
			Speed change systems for trim actuators
			Interlocks
			Elevator/stabiliser interaction
C of G Trimmers	1	2	Computation
			Indication
Demand Signals	1	2	Control wheel steering systems
			Touch wheel steering systems
Automatic Throttle Systems	1	2	Control input
			Related engine controls
			Sensors
			Engine coupling units: clutches and servo-motors
			Override and safety considerations
			Modes of operation
			Electronic engine control: microprocessor inputs and control
Automatic Landing Systems	1	2	Principles, requirements and approach categories
			Types of systems operation: dual or triple channel
			System operation on approach
			Monitors and failure conditions
			Roll-out control
			BITE

	1	3	Category downgrade and reinstatement procedures
Digital Flight Systems	1	2	Flight management systems

Module 25 Automatic Pilots – Common - Category ‘X’

Syllabus Subject	Level		Details
	WTR	TR	
Error Signals	1	2	Rate system – errors and control
			Displacement system – errors and control
			Heading and course error inputs
			Radio beam deviation inputs
			Attitude inputs

			CADC/autopilot interface – e.g. q or % adaptation
			Sideslip sensors and monitors
Signal Processing	1	2	Typical channel signal flow path
			Buffer amps
			Input signal modulation
			Summing points
			Signal sensors and switching functions
			Integrators
			Limiters
			Gain programmes
			Dual channel monitors
			Voter systems
Demand Signals	1	2	Mode selectors
			Control display units
			Turn controllers
			Control column transducers
			Command override systems

			Mode compatibility
			Mode annunciators
			Failure and disconnect lights and aural warnings
			Interlocks – pre and post-engage
			Pitch attitude trim
			Roll out/heading-hold, engage
			Synchronisation
			Trim monitors and indicators
			Altitude hold inputs
			Vertical speed control
			Mach/IAS hold
			Altitude acquire or change systems
Command Signal Outputs	1	2	Power control units – line replaceable units
			Solenoid valves
			Transfer valves
			Position sensors
			Servomotors-construction,inter-connection with control runs
			Clutches – torque settings
			Brakes
			Tachogenerators –feedback and damping
			Position feedback - indication
			Torque limiting
			Hardover sensing – disconnection
			Jam detection
			Runway conditions – disconnection
			Pilot override - disconnection

Module 26 Automatic Pilots – Rotorcraft- Category ‘X’

Syllabus Subject	Level		Details
	WTR	TR	
Theory of Flight (Rotorcraft)	1	2	Rotor disc: forces, lift, drag, centrifugal force, weight, phase lag
			Articulated/ semi-rigid/ rigid rotors flapping/ dragging/ feathering
			Vertical and translational flight
			Main and anti-torque rotors, control inputs cyclic, collective, rudder pedals
			Directional control
			Autorotation
			Forward speed effects
Command Outputs	1	2	Actuators
			Indicators
Trim Systems	1	2	Manual/Automatic
			Indication
Stability Augmentation Systems	1	2	Actuators
			Indicators
			Computation

Module 30 Compass Compensation

Syllabus Subject	Level		Details
	WTR	TR	
Compass Compensation	2	-	Base survey techniques
			Compass swinging areas
			Aircraft magnetism
			Terrestrial magnetism – variation

			Methods and procedures for swinging compasses
	1	-	Flux valve operation
	3	-	Deviation: calculations and effects on a compass
			Compensation and adjustment procedures
	1	-	Various compass types

Module 31 Radio Communication and Navigation – Category ‘R’

Syllabus Subject	Level		Details
	WTR	TR	
Radio Theory	1	-	Propagation of radio waves
			Polarisation
			Radiation patterns
			Transmitters and receivers
			RF Amps, IF Amps
			Oscillators, frequency synthesisers
			Frequency multipliers
			Mixers, detectors, BFO, AGC
			Noise limiters, muting circuits, audio amplifiers
			Modulators, RF power amplifiers matching units
			Filters and tuned circuits
Interference	2	-	Principles and methods used to minimise the effects of conducted and radiated interference

			Methods used to minimise the effects of lightning strikes and static on aerials
Aerials and Feeders	2	-	Diplexers, baluns and matching stubs
			Fixed and variable matching arrangements
			Locations and types of aerials – communication and navigation
			Bandwidth and effective height of an aerial
Communication	2	-	Calculation of standing wave ratio
			Control and monitoring circuits
Audio Systems	2	-	Intercommunication
			Audio mixing and distribution systems
			Public address and entertainment systems
			Headsets and microphones
Cockpit Voice Recorder	2	-	Signal sources
			Control circuitry: hot microphone
			Requirements
VHF/HF Communications	2	-	Airborne installations
VOR/ILS	1	-	Ground station signals
	2	-	Airborne installations
			Control
			Monitors
			Indicators
			Loading
			AFCS and instrument interface
Marker	1	-	Ground installations
	2	-	Airborne systems

Automatic Direction Finding	2	-	Receiver
			Loop and sense aerials and feeders
			Bearing errors and correction devices
			Loop swings

Satellite Communication and Navigation (GPS) Systems	1	-	Airborne installations
			Receiver, computer
	2	-	Displays
			Interface with other systems
Flight Compartment			
Electronic Display Systems	1	-	EADI; EHSI; symbol generators
			Control panels
			Comparators and monitors
Microwave Landing Systems (TRSB)	1	-	Receiver, computer
			Interface with other systems
RNAV	1	-	Computer
			Interface with other systems
			Indications

Module 32 Radar Systems – Category ‘R’

Syllabus Subject	Level		Details
	WTR	TR	
Pulse Techniques	1	-	Radar transmitter/receiver
			Pulse modulation
			Peak power, average power
			Duty cycle, pulse shape, pulse width

			Pulse rise time and repetition frequency
			Range accuracy and resolution
			Receiver bandwidth
			Noise
Primary Radar	2	-	Weather radar:
			Control and monitoring circuits
			Indicators; displays
			Scanners; waveguides
	2	-	Doppler:
			Aerials

			Indicators
			Interface with other equipment
	2	-	Radio altimeters:
			Pulse and FM, CW systems
Secondary Radar	2	-	DME:
			Indicators
			Control and monitor circuits
			Interface with other aircraft systems
			ATC Transponders:
			Instrument system interface
			Control and monitor circuits
	1	-	TCAS:
			Indicators
			Control and monitor circuits
			Interface with other aircraft systems

Cross reference

Civil Aviation (Operation of Aircraft-Commercial Air Transport Aeroplanes) Regulations, 2022 S.I. No. 84 of 2022

Civil Aviation (Operation of Aircraft) (Commercial Air Transport) (General Aviation) (Helicopters) Regulations, 2022 S.I. No. 85 of 2022

Civil Aviation (Operation of Aircraft) (General Aviation) (Aeroplanes) Regulations, 2022 S.I. No. 86 of 2022

Civil Aviation (Approved Training Organisations) Regulations, 2022 S.I. No. 79 of 2022

Civil Aviation (Approved Maintenance Organisations) Regulations, 2022 S.I. No. 78 of 2022

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