



**Bharat Institute of
Aeronautics**

Patna Airport, Patna - 800 014



SYLLABUS
CATEGORY A 1
LINE MAINTENANCE



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4.2-SYLLABUS OF EACH TRAINING COURSE

SYLLABUS FOR CAT-A1

TYPE OF TRAINING	LOCATION	ALLOTTED TIME (MINIMUM)
		Cat. A1
Knowledge Training	In-House	280 Hours
Practical Training	In-House	364 Hours
	Sub-contracted	156 Hours
Total Hours		800 Hours



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KNOWLEDGE TRAINING	
Mod. No.	Module Name
M.03	Electrical Fundamentals
M.05	Digital Techniques/electronic Instrument Systems
M.06	Materials and Hardware
M.7a	Maintenance Practices
M.08	Basic Aerodynamics
M.9a	Human Factors
M.10	Aviation Legislation
M.11a	Turbine Aero plane Aerodynamics, Structures And Systems
M.15	Gas Turbine Engine
M.17a	Propeller



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MODULE 3. ELECTRICAL FUNDAMENTALS



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MODULE 3. ELECTRICAL FUNDAMENTALS

S. No.	Main Topic	Sub-Topic	LEVEL
3.1	Electron Theory	Structure and distribution of electrical charges within: atoms, molecules, ions, compounds; Molecular structure of conductors, semiconductors and insulators.	1
3.2	Static Electricity and Conduction	Static electricity and distribution of electrostatic charges; Electrostatic laws of attraction and repulsion; Units of charge, Coulomb's Law; Conduction of electricity in solids, liquids, gases and a vacuum.	1
3.3	Electrical Terminology	The following terms, their units and factors affecting them: potential difference, electromotive force, voltage, current, resistance, conductance, charge, conventional current flow, electron flow.	1
3.4	Generation of Electricity	Production of electricity by the following methods: light, heat, friction, pressure, chemical action, magnetism and motion.	1



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3.5	DC Sources of Electricity	<p>Construction and basic chemical action of: primary cells, secondary cells, lead acid cells, nickel cadmium cells, other alkaline cells;</p> <p>Cells connected in series and parallel;</p> <p>Internal resistance and its effect on a battery;</p> <p>Construction, materials and operation of thermocouples;</p> <p>Operation of photo-cells.</p>	1
3.13	AC Theory	<p>Sinusoidal waveform: phase, period, frequency, cycle;</p> <p>Instantaneous, average, root mean square, peak, peak to peak current values and calculations of these values, in relation to voltage, current and power;</p> <p>Triangular/Square waves;</p> <p>Single/3 phase principles.</p>	1



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**MODULE 5.
DIGITAL
TECHNIQUES/ELECTRONI
C INSTRUMENT SYSTEM**



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MODULE 5. DIGITAL TECHNIQUES/ELECTRONIC INSTRUMENT SYSTEM

S. No.	Main Topic	Sub-Topic	LEVEL
5.1	Electronic Instrument Systems	Typical systems arrangements and cockpit layout of electronic instrument systems.	1
5.6	Basic Computer Structure	(a) Computer terminology (including bit, byte, software, hardware, CPU, IC, and various memory devices such as RAM, ROM, PROM); Computer technology (as applied in aircraft systems).	1
5.12	Electrostatic Sensitive Devices	Special handling of components sensitive to electrostatic discharges; Awareness of risks and possible damage, component and personnel anti-static protection devices.	1



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MODULE 6. MATERIALS AND HARDWARE



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MODULE 6. MATERIALS AND HARDWARE

S. No.	Main Topic	Sub-Topic	LEVEL
6.1	Aircraft Materials-Ferrous	(a) Characteristics, properties and identification of common alloy steels used in aircraft; Heat treatment and application of alloy steels.	1
6.2	Aircraft Materials-Non-Ferrous	(a) Characteristics, properties and identification of common non-ferrous materials used in aircraft; Heat treatment and application of non-ferrous materials;	1
6.3	6.3.1 Composite and non-metallic other than wood and fabric	(a) Characteristics, properties and identification of common composite and non-metallic materials, other than wood, used in aircraft; Sealant and bonding agents	1
		(b) The detection of defects/deterioration in composite and non-metallic material; Repair of composite and non-metallic material	1
	6.3.2 Wooden structures	Construction methods of wooden airframe structures; Characteristics, properties and types of wood and glue used in aero planes; Preservation and maintenance of wooden structure; Types of defects in wood material and wooden structures; The detection of defects in wooden structure; Repair of wooden structure.	1



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	6.3.3. Fabric covering	Characteristics, properties and types of fabrics used in aero planes; Inspections methods for fabric; Types of defects in fabric; Repair of fabric covering	1
6.4	Corrosion	(a) Chemical fundamentals; Formation by, galvanic action process, microbiological, stress;	1
		(b) Types of corrosion and their identification; Causes of corrosion; Material types, susceptibility to corrosion	2
6.5	Fasteners		
	6.5.1 Screw threads	Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; Measuring screw threads.	2
	6.5.2 Bolts, studs and screws	Bolt types: specification, identification and marking of aircraft bolts, international standards; Nuts: self locking, anchor, standard types; Machine screws: aircraft specifications; Studs: types and uses, insertion and removal; Self tapping screws, dowels.	2
	6.5.3 Locking devices	Tab and spring washers, locking plates, split pins, pal-nuts, wire locking, quick release fasteners, keys, circlips, cotter pins	2
	6.5.4 Aircraft rivets	Types of solid and blind rivets: specifications and identification, heat treatment.	1
6.6	Pipes and Unions	(a) Identification of, and types of rigid and flexible pipes and their connectors used in aircraft	2
		(b) Standard unions for aircraft hydraulic, fuel, oil, pneumatic and air system pipes	2



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6.8	Bearings	Purpose of bearings, loads, material, construction; Types of bearings and their application.	1
6.9	Transmissions	Gear types and their application; Gear ratios, reduction and multiplication gear systems, driven and driving gears, idler gears, mesh patterns; Belts and pulleys, chains and sprockets.	1
6.10	Control Cables	Types of cables; End fittings, turnbuckles and compensation devices; Pulleys and cable system components; Bowden cables; Aircraft flexible control systems	1
6.11	Electrical Cables and Connectors	Cable types, construction and characteristics; High tension and co-axial cables; Crimping; Connector types, pins, plugs, sockets, insulators, current and voltage rating, coupling, identification codes	1



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MODULE 7a
MAINTENANCE
PRACTICES



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MODULE 7. MAINTENANCE PRACTICES

S. No.	Main Topic	Sub-Topic	LEVEL
7.1	Safety Precautions- Aircraft and Workshop	Aspects of safe working practices including precautions to take when working with electricity, gases especially oxygen, oils and chemicals. Also, instruction in the remedial action to be taken in the event of a fire or another accident with one or more of these hazards including knowledge on extinguishing agents.	3
7.2	Workshop Practices	Care of tools, control of tools, use of workshop materials; Dimensions, allowances and tolerances, standards of workmanship; Calibration of tools and equipment, calibration standards	3
7.3	Tools	Common hand tool types; Common power tool types; Operation and use of precision measuring tools; Lubrication equipment and methods. Operation, function and use of electrical general test equipment.	3
7.5	Engineering Drawings, Diagrams and Standards	Drawing types and diagrams, their symbols, dimensions, tolerances and projections; Identifying title block information;	1



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		Microfilm, microfiche and computerized presentations; Specification 100 of the Air Transport Association (ATA) of America; Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL; Wiring diagrams and schematic diagrams	
7.6	Fits and Clearances	Drill sizes for bolt holes, classes of fits; Common system of fits and clearances; Schedule of fits and clearances for aircraft and engines; Limits for bow, twist and wear; Standard methods for checking shafts, bearings and other parts.	1
7.7	Electrical Wiring Interconnection System (EWIS)	Continuity, insulation and bonding techniques and testing; Use of crimp tools: hand and hydraulic operated; Testing of crimp joints; Connector pin removal and insertion; Co-axial cables: testing and installation precautions; Identification of wire types, their inspection criteria and damage tolerance. Wiring protection techniques: Cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding;	1



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		EWIS installations, inspection, repair, maintenance and cleanliness standards.	
7.8	Riveting	Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.	1
7.9	Pipes and Hoses	Bending and belling/flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes.	1
7.10	Springs	Inspection and testing of springs.	1
7.11	Bearings	Testing, cleaning and inspection of bearings; Lubrication requirements of bearings; Defects in bearings and their causes.	1
7.12	Transmissions	Inspection of gears, backlash; Inspection of belts and pulleys, chains and sprockets; Inspection of screw jacks, lever devices, push-pull rod systems.	1
7.13	Control Cables	Swaging of end fittings; Inspection and testing of control cables; Bowden cables; aircraft flexible control systems.	1
7.17	Aircraft Handling and Storage	Aircraft taxiing/towing and associated safety precautions; Aircraft jacking, chocking, securing and associated safety precautions; Aircraft storage methods; Refueling/defueling procedures; De-icing/anti-icing procedures; Electrical, hydraulic and pneumatic ground supplies. Effects of environmental conditions on aircraft handling and operation.	2



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7.18	Disassembly, Inspection, Repair and Assembly Techniques	(a) Types of defects and visual inspection techniques; Corrosion removal, assessment and reproduction	2
		(d) Disassembly and re-assembly techniques;	2
7.19	Abnormal Events	(a) Inspections following lightning strikes and HIRF penetration;	2
		(b) Inspections following abnormal events such as heavy landings and flight through turbulence.	2
7.20	Maintenance Procedures	Maintenance planning; Modification procedures; Stores procedures; Certification/release procedures; Interface with aircraft operation; Maintenance Inspection/Quality Control/Quality Assurance; Additional maintenance procedures; Control of life limited components.	1



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MODULE 8. BASIC AERODYNAMICS



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MODULE 8. BASIC AERODYNAMICS

S. No.	Main Topic	Sub-Topic	LEVEL
8.1	Physics of the Atmosphere	International Standard Atmosphere (ISA), application to aerodynamics	1
8.2	Aerodynamics	Airflow around a body; Boundary layer, laminar and turbulent flow, free stream flow, relative airflow, up wash and downwash, vortices, stagnation; The terms: camber, chord, mean aerodynamic chord, profile (parasite) drag, induced drag, centre of pressure, angle of attack, wash in and wash out, fineness ratio, wing shape and aspect ratio; Thrust, Weight, Aerodynamic Resultant; Generation of Lift and Drag: Angle of Attack, Lift coefficient, Drag coefficient, polar curve, stall; Aerofoil contamination including ice, snow, frost	1
8.3	Theory of Flight	Relationship between lift, weight, thrust and drag; Glide ratio; Steady state flights, performance; Theory of the turn; Influence of load factor: stall, flight envelope and structural limitations; Lift augmentation.	1
8.4	Flight Stability and Dynamics	Longitudinal, lateral and directional stability (active and passive).	1



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MODULE 9A. HUMAN FACTOR



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MODULE 9A. HUMAN FACTOR

S. No.	Main Topic	Sub-Topic	LEVEL
9.1	General	The need to take human factors into account; Incidents attributable to human factors/human error; 'Murphy's' law.	1
9.2	Human Performance and Limitations	Vision; Hearing; Information processing; Attention and perception; Memory; Claustrophobia and physical access.	1
9.3	Social Psychology	Responsibility: individual and group; Motivation and de-motivation; Peer pressure; 'Culture' issues; Team working; Management, supervision and leadership.	1
9.4	Factors Affecting Performance	Fitness/health; Stress: domestic and work related; Time pressure and deadlines; Workload: overload and under load; Sleep and fatigue, shift work; Alcohol, medication, drug abuse.	2
9.5	Physical Environment	Noise and fumes; Illumination; Climate and temperature; Motion and vibration; Working environment.	1



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9.6	Tasks	Physical work; Repetitive tasks; Visual inspection; Complex systems.	1
9.7	Communication	Within and between teams; Work logging and recording; Keeping up to date, currency; Dissemination of information.	2
9.8	Human Error	Error models and theories; Types of error in maintenance tasks; Implications of errors (i.e. accidents); Avoiding and managing errors.	1
9.9	Hazards in the Workplace	Recognizing and avoiding hazards; Dealing with emergencies.	1



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MODULE 10. AVIATION LEGISLATION



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MODULE 10. AVIATION LEGISLATION

S. No.	Main Topic	Sub-Topic	LEVEL
10.1	Regulatory Framework	Role of the International Civil Aviation Organisation; The Aircraft Act and Rules made there under Role of the DGCA; Relationship between CAR-21, CAR-M, CAR-145, CAR-66, CAR-147 The Aircraft Rules (Applicable to Aircraft Maintenance and release) Aeronautical Information and Circulars (Applicable to Aircraft Maintenance and release) CAR Sections 1 and 2	1
10.2	CAR-66 Certifying Staff-Maintenance	Detailed understanding of CAR-66.	2
10.3	CAR-145 Approved Maintenance Organisations	Detailed understanding of CAR-145 and CAR-M Subpart F.	2
10.4	Aircraft operations	Commercial Air Transport/Commercial Operations Air Operators Certificates; Operator's responsibilities, in particular regarding continuing airworthiness and maintenance; Documents to be carried on board; Aircraft placarding (markings).	1



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10.6	CAR-M	Detailed understanding of CAR-M provisions related to continuing airworthiness. Detailed understanding of CAR-M.	2
10.7	Applicable National and International Requirements	(a) Maintenance Programs, Maintenance checks and inspections, Master Minimum Equipment Lists, Minimum Equipment List, Dispatch Deviation Lists, Airworthiness Directives, Service Bulletins, Manufacturers service information, Modifications and repairs, Maintenance Documentation: maintenance manuals, structural repair manual, illustrated parts catalogue, etc.	1
10.8	Safety Management System	State safety programme, Basic safety Concepts Hazards and safety Risks SMS Operations SMS Safety Performance Safety Assurance	2
10.9	Fuel Tank Safety	Special Federal Aviation Regulations (SFARs) from 14 CFR SFAR 88 of the FAA and JAA TGL 47 Airworthiness Limitations Items (ALI)	2



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**MODULE 11A.
TURBINE AEROPLANE
AERODYNAMICS,
STRUCTURES AND
SYSTEMS**



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**MODULE 11A. TURBINE AEROPLANE AERODYNAMICS,
STRUCTURES AND SYSTEMS**

S. No.	Main Topic	Sub-Topic	LEVEL
11.1	Theory of Flight		
	11.1.1 Aero plane Aerodynamics and Flight Controls	Operation and effect of: — roll control: ailerons and spoilers, — pitch control: elevators, stabilities, variable incidence stabilizers and canards, — yaw control, rudder limiters; 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 anti balance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels.	1
	11.1.2 High Speed Flight	Speed of sound, subsonic flight, transonic flight, supersonic flight; Mach number, critical Mach number, compressibility buffet,	1



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		<p>shock wave, aerodynamic heating, area rule; Factors affecting airflow in engine intakes of high speed aircraft; Effects of sweepback on critical Mach number.</p>	
11.2	Airframe Structures- General Concepts	<p>(a) Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Zonal and station identification systems; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Drains and ventilation provisions; System installation provisions; Lightning strike protection provision; Aircraft bonding.</p>	2
		<p>(b) 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; Structure assembly techniques: riveting, bolting, bonding;</p>	1



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		Methods of surface protection, such as chromating, anodizing, painting; Surface cleaning; Airframe symmetry: methods of alignment and symmetry checks.	
11.3	Airframe Structures — Aero planes		
	11.3.1 Fuselage (ATA 52/53/56)	Construction and pressurization sealing; Wing, stabilizer, pylon and undercarriage attachments; Seat installation and cargo loading system; Doors and emergency exits: construction, mechanisms, operation and safety devices; Windows and windscreen construction and mechanisms.	1
	11.3.2 Wings (ATA 57)	Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.	1
	11.3.3 Stabilizers (ATA 55)	Construction; Control surface attachment.	1
	11.3.4 Flight Control Surfaces (ATA 55/57)	Construction and attachment; Balancing — mass and aerodynamic.	1
	11.3.5 Nacelles/Pylons (ATA 54)	Nacelles/Pylons: — Construction, — Firewalls, — Engine mounts.	1



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11.4	Air Conditioning and Cabin Pressurization (ATA 21)		
	11.4.1 Air supply	Sources of air supply including engine bleed, APU and ground cart.	1
	11.4.2 Air Conditioning	Air conditioning systems; Air cycle and vapour cycle machines; Distribution systems; Flow, temperature and humidity control system.	1
	11.4.3 Pressurization	Pressurization systems; Control and indication including control and safety valves; Cabin pressure controllers.	1
	11.4.4 Safety and warning devices	Protection and warning devices.	1
	11.5 Instruments/Avionic Systems		
	11.5.1 Instrument Systems (ATA 31)	Pitot static: altimeter, air speed indicator, vertical speed indicator; Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator; Compasses: direct reading, remote reading;	1



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		Angle of attack indication, stall warning systems; Glass cockpit; Other aircraft system indication.	
	11.5.2 Avionic Systems	Fundamentals of system lay-outs and operation of: — Auto Flight (ATA 22), — Communications (ATA 23), — Navigation Systems (ATA 34).	1
11.6	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.	1
11.7	Equipment and Furnishings (ATA 25)	(a) Emergency equipment requirements; Seats, harnesses and belts.	2
		(b) Cabin lay-out; Equipment lay-out; Cabin Furnishing installation; Cabin entertainment equipment; Galley installation; Cargo handling and retention equipment; Air stairs.	1
11.8	Fire Protection (ATA 26)	(a) Fire and smoke detection and warning systems; Fire extinguishing systems; System tests;	1
		(b) Portable fire extinguisher.	1



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11.9	Flight Controls (ATA 27)	<p>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 lock systems; Balancing and rigging; Stall protection/warning system.</p>	1
11.10	Fuel Systems (ATA 28)	<p>System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Cross-feed and transfer; Indications and warnings; Refueling and defueling; Longitudinal balance fuel systems.</p>	1
11.11	Hydraulic Power (ATA 29)	<p>System lay-out; Hydraulic fluids; Hydraulic reservoirs and accumulators; Pressure generation: electric, mechanical, pneumatic; Emergency pressure generation; Filters; Pressure Control; Power distribution; Indication and warning systems; Interface with other systems.</p>	1



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11.12	Ice and Rain Protection (ATA 30)	Ice formation, classification and detection; Anti-icing systems: electrical, hot air and chemical; De-icing systems: electrical, hot air, pneumatic and chemical; Rain repellent; Probe and drain heating; Wiper systems. Ice formation, classification and detection; Anti-icing systems: electrical, hot air and chemical; De-icing systems: electrical, hot air, pneumatic and chemical; Rain repellent; Probe and drain heating; Wiper systems.	1
11.13	Landing Gear (ATA 32)	Construction, shock absorbing; Extension and retraction systems: normal and emergency; Indications and warning; Wheels, brakes, antiskid and auto braking; Tyres; Steering; Air-ground sensing.	2
11.14	Lights (ATA 33)	External: navigation, anti collision, landing, taxiing, ice; Internal: cabin, cockpit, cargo; Emergency.	2
11.15	Oxygen (ATA 35)	System lay-out: cockpit, cabin; Sources, storage, charging and distribution; Supply regulation; Indications and warnings.	1



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11.16	Pneumatic/Vacuum (ATA 36)	System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply; Pressure control; Distribution; Indications and warnings; Interfaces with other systems.	1
11.17	Water/Waste (ATA 38)	Water system lay-out, supply, distribution, servicing and draining; Toilet system lay-out, flushing and servicing; Corrosion aspects.	2
11.18	On Board Maintenance Systems (ATA 45)	Central maintenance computers; Data loading system; Electronic library system; Printing; Structure monitoring (damage tolerance monitoring).	1
11.19	Integrated Modular Avionics (ATA42)	Functions that may be typically integrated in the Integrated Modular Avionic (IMA) modules are, among others: Bleed Management, Air Pressure Control, Air Ventilation and Control, Avionics and Cockpit Ventilation Control, Temperature Control, Air Traffic Communication, Avionics Communication Router, Electrical	1



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		Load Management, Circuit Breaker Monitoring, Electrical System BITE, Fuel Management, Braking Control, Steering Control, Landing Gear Extension and Retraction, Tyre Pressure Indication, Oleo Pressure Indication, Brake Temperature Monitoring, etc. Core System; Network Components.	
11.20	Cabin Systems (ATA44)	The units and components which furnish a means of entertaining the passengers and providing communication within the aircraft (Cabin Intercommunication Data System) and between the aircraft cabin and ground stations (Cabin Network Service). Includes voice, data, music and video transmissions. The Cabin Intercommunication Data System provides an interface between cockpit/cabin crew and cabin systems. These systems support data exchange of the different related LRU's and they are typically operated via Flight Attendant Panels.	1
11.21	Information Systems (ATA46)	The units and components which furnish a means of storing, updating and retrieving digital information	1



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		<p>traditionally provided on paper, microfilm or microfiche. Includes units that are dedicated to the information storage and retrieval function such as the electronic library mass storage and controller.</p> <p>Does not include units or components installed for other uses and shared with other systems, such as flight deck printer or general use display.</p> <p>Typical examples include Air Traffic and Information Management Systems and Network Server Systems</p> <p>Aircraft General Information System;</p> <p>Flight Deck Information System;</p> <p>Maintenance Information System;</p> <p>Passenger Cabin Information System;</p> <p>Miscellaneous Information System.</p>	
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MODULE 15. GAS TURBINE ENGINE



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MODULE 15. GAS TURBINE ENGINE

S. No.	Main Topic	Sub-Topic	LEVEL
15.1	Fundamentals	Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle; The relationship between force, work, power, energy, velocity, acceleration; Constructional arrangement and operation of turbojet, turbofan, turbo shaft, turboprop.	1
15.3	Inlet	Compressor inlet ducts Effects of various inlet configurations; Ice protection.	2
15.4	Compressors	Axial and centrifugal types; Constructional features and operating principles and applications; Fan balancing; Operation: Causes and effects of compressor stall and surge; Methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades; Compressor ratio.	1
15.5	Combustion Section	Constructional features and principles of operation.	1
15.6	Turbine Section	Operation and characteristics of different turbine blade types; Blade to disk attachment; Nozzle guide vanes;	2



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		Causes and effects of turbine blade stress and creep.	
15.7	Exhaust	Constructional features and principles of operation; Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers.	1
15.9	Lubricants and Fuels	Properties and specifications; Fuel additives; Safety precautions.	1
15.10	Lubrication Systems	System operation/lay-out and components.	1
15.11	Fuel Systems	Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components.	1
15.12	Air Systems	Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.	1
15.13	Starting and Ignition Systems	Operation of engine start systems and components; Ignition systems and components; Maintenance safety requirements.	1
15.14	Engine Indication Systems	Exhaust Gas Temperature/Inter stage Turbine Temperature; Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems; Oil pressure and temperature; Fuel pressure and flow; Engine speed;	1



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		Vibration measurement and indication; Torque; Power.	
15.16	Turbo-prop Engines	Gas coupled/free turbine and gear coupled turbines; Reduction gears; Integrated engine and propeller controls; Over speed safety devices.	1
15.17	Turbo-shaft Engines	Arrangements drive systems, reduction gearing, couplings, control systems.	1
15.18	Auxiliary Power Units (APUs)	Purpose, operation, protective systems.	1
15.19	Power plant Installation	Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.	1
15.20	Fire protection Systems	Operation of detection and extinguishing systems.	1
15.21	Engine Monitoring and Ground Operation	Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Trend (including oil analysis, vibration and baroscopic) monitoring; Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer; Compressor washing/cleaning; Foreign Object Damage.	1



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MODULE 17A. PROPELLER



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MODULE 17A. PROPELLER

S. No.	Main Topic	Sub-Topic	LEVEL
17.1	Fundamentals	Blade element theory; High/low blade angle, reverse angle, angle of attack, rotational speed; Propeller slip; Aerodynamic, centrifugal, and thrust forces; Torque; Relative airflow on blade angle of attack; Vibration and resonance.	1
17.2	Propeller Construction	Construction methods and materials used in wooden, composite and metal propellers; Blade station, blade face, blade shank, blade back and hub assembly; Fixed pitch, controllable pitch, constant speeding propeller; Propeller/spinner installation.	1
17.3	Propeller Pitch Control	Speed control and pitch change methods, mechanical and electrical/electronic; Feathering and reverse pitch; Over speed protection.	1
17.5	Propeller Ice Protection	Fluid and electrical de-icing equipment.	1
17.6	Propeller Maintenance	Static and dynamic balancing; Blade tracking; Assessment of blade damage, erosion, corrosion, impact damage, delimitation; Propeller treatment/repair schemes; Propeller engine running.	1
17.7	Propeller Storage and Preservation	Propeller preservation and de- preservation.	1