

MODULE 15. GAS TURBINE ENGINE

	Level		
	A	B1	B2
15.1 Fundamentals	1	2	—
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, turboshaft, turboprop.			
15.2 Engine Performance	—	2	—
Gross thrust, net thrust, choked nozzle thrust, thrust distribution, resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption;			
Engine efficiencies;			
By-pass ratio and engine pressure ratio;			
Pressure, temperature and velocity of the gas flow;			
Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations.			

	Level		
	A	B1	B2
15.3 Inlet	2	2	—
Compressor inlet ducts			
Effects of various inlet configurations;			
Ice protection.			
15.4 Compressors	1	2	—
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.			
15.5 Combustion Section	1	2	—
Constructional features and principles of operation.			
15.6 Turbine Section	2	2	—
Operation and characteristics of different turbine blade types;			
Blade to disk attachment;			
Nozzle guide vanes;			
Causes and effects of turbine blade stress and creep.			
15.7 Exhaust	1	2	—
Constructional features and principles of operation;			
Convergent, divergent and variable area nozzles;			
Engine noise reduction;			
Thrust reversers.			
15.8 Bearings and Seals	—	2	—
Constructional features and principles of operation.			
15.9 Lubricants and Fuels	1	2	—
Properties and specifications;			
Fuel additives;			
Safety precautions.			

	Level		
	A	B1	B2
15.10 Lubrication Systems	1	2	—
System operation/lay-out and components.			
15.11 Fuel Systems	1	2	—
Operation of engine control and fuel metering systems including electronic engine control (FADEC);			
Systems lay-out and components.			
15.12 Air Systems	1	2	—
Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.			
15.13 Starting and Ignition Systems	1	2	—
Operation of engine start systems and components;			
Ignition systems and components;			
Maintenance safety requirements.			
15.14 Engine Indication Systems	1	2	—
Exhaust Gas Temperature/Interstage 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;			
Vibration measurement and indication;			
Torque;			
Power.			
15.15 Power Augmentation Systems	—	1	—
Operation and applications;			
Water injection, water methanol;			
Afterburner systems.			
15.16 Turbo-prop Engines	1	2	—
Gas coupled/free turbine and gear coupled turbines;			
Reduction gears;			
Integrated engine and propeller controls;			
Overspeed safety devices.			

	Level		
	A	B1	B2
<p>15.17 Turbo-shaft engines</p> <p>Arrangements, drive systems, reduction gearing, couplings, control systems.</p>	1	2	—
<p>15.18 Auxiliary Power Units (APUs)</p> <p>Purpose, operation, protective systems.</p>	1	2	—
<p>15.19 Powerplant Installation</p> <p>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.</p>	1	2	—
<p>15.20 Fire Protection Systems</p> <p>Operation of detection and extinguishing systems.</p>	1	2	—
<p>15.21 Engine Monitoring and Ground Operation</p> <p>Procedures for starting and ground run-up;</p> <p>Interpretation of engine power output and parameters;</p> <p>Trend (including oil analysis, vibration and boroscope) monitoring;</p> <p>Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer;</p> <p>Compressor washing/cleaning;</p> <p>Foreign Object Damage.</p>	1	3	—
<p>15.22 Engine Storage and Preservation</p> <p>Preservation and depreservation for the engine and accessories/systems.</p>	—	2	—