MODULE 15 – GAS TURBINE ENGINE

Sl. No.	Topics to be Covered		Level B1.1
15.1.	**FUNDAMENTALS**		
	a.	Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle;	2
	b.	The relationship between force, work, power, energy, velocity, acceleration;	
	c.	Constructional arrangement and operation of turbojet, turbofan, turbo shaft, turboprop	
15.2.	**ENGINE PERFORMANCE**		
	a.	Gross thrust, net thrust, choked nozzle thrust, thrust distribution, resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption;	2
	b.	Engine efficiencies;	
	c.	By-pass ratio and engine pressure ratio;	
	d.	Pressure, temperature and velocity of the gas flow;	
	e.	Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations	
15.3.	**INLET**		
	a.	Compressor inlet ducts	2
	b.	Effects of various inlet configurations;	
	c.	Ice protection.	
15.4.	**COMPRESSORS**		
	a.	Axial and centrifugal types;	2
	b.	Constructional features and operating principles and applications;	
	c.	Fan balancing;	
	d.	Operation:	
	e.	Causes and effects of compressor stall and surge;	
	f.	Methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades	
	g.	Compressor ratio.	
15.5.	**COMBUSTION SECTION**		
	a.	Constructional features and principles of operation.	2
15.6.	**TURBINE SECTION**		
	a.	Operation and characteristics of different turbine blade types;	2
	b.	Blade to disk attachment;	
	c.	Nozzle guide vanes;	
	d.	Causes and effects of turbine blade stress and creep.	

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15.7.	**EXHAUST**		
	a.	Constructional features and principles of operation;	2
	b.	Convergent, divergent and variable area nozzles;	
	c.	Engine noise reduction;	
	d.	Thrust reversers.	
15.8.	**BEARINGS AND SEAL**		
	a.	Constructional features and principles of operation.	2
15.9.	**LUBRICANTS AND FUELS**		
	a.	Properties and specifications;	2
	b.	Fuel additives;	
	c.	Safety precautions.	
15.10.	**LUBRICATION SYSTEMS**		
	a.	System operation/lay-out and components.	2
15.11.	**FUEL SYSTEM**		
	a.	Operation of engine control and fuel metering systems including electronic engine control (FADEC);	2
	b.	Systems lay-out and components.	
15.12.	**AIR SYSTEMS**		
	a.	Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.	2
15.13.	**STARTING AND IGNITION SYSTEMS**		
	a.	Operation of engine start systems and components;	2
	b.	Ignition systems and components;	
	c.	Maintenance safety requirements	
15.14.	**ENGINE INDICATION SYSTEMS**		
	a.	Exhaust Gas Temperature/Interstage Turbine Temperature;	2
	b.	Engine Thrust Indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems;	
	c.	Oil pressure and temperature;	
	d.	Fuel pressure and flow;	
	e.	Engine speed;	
	f.	Vibration measurement and indication;	
	g.	Torque;	
	h.	Power.	

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15.15.	**POWER AUGMENTATION SYSTEMS**		
	a.	Operation and applications;	1
	b.	Water injection, water methanol;	
	c.	Afterburner systems.	
15.16.	**TURBO-PROP ENGINES**		
	a.	Gas coupled/ free turbine and gear coupled turbines;	2
	b.	Reduction gears;	
	c.	Integrated engine and propeller controls;	
	d.	Overspeed safety devices.	
15.17.	**TURBO-SHAFT ENGINES**		
	a.	Arrangements, drive systems, reduction gearing,	2
	b.	Couplings, control systems.	
15.18.	**AUXILIARY POWER UNITS (APUS)**		
	a.	Purpose, operation, protective systems.	2
15.19.	**POWER PLANT INSTALLATION**		
	a.	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.	2
15.20.	**FIRE PROTECTION SYSTEMS**		
	a.	Operation of detection and extinguishing systems.	2
15.21.	**ENGINE MONITORING AND GROUND OPERATION**		
	a.	Procedures for starting and ground run-up;	3
	b.	Interpretation of engine power output and parameters;	
	c.	Trend (including oil analysis, vibration and Boroscope) monitoring;	
	d.	Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer;	
	e.	Compressor washing/cleaning;	
	f.	Foreign Object Damage.	
15.22.	**ENGINE STORAGE AND PRESERVATION**		
	a.	Preservation and de-preservation for the engine and accessories/ systems.	2