

N°	MODULE 18 — ELECTRIC POWER PLANT		
Item	Sous-item	texte	Niv B1.E
18.1	18.1 <i>Fundamentals:</i>	<ul style="list-style-type: none"> — Basic principles of electric propulsion — Power, torque, speed, and efficiency relationships — Electromagnetic principles relevant to electric machines — Thermal management principles 	3
18.2	18.2 <i>Engine performance:</i>	<ul style="list-style-type: none"> — Power and torque characteristics of electric engines — Efficiency maps and operating envelopes — Effects of temperature, voltage, and current on performance — Regenerative operation principles (where applicable) — Performance limitations and protection functions 	3
18.3	18.3 <i>Engine construction:</i>	<ul style="list-style-type: none"> — Types of electric engines (permanent magnet synchronous (PMSM), induction, switched reluctance, etc.) — Stator and rotor construction — Bearings, shafts, and cooling arrangements — Insulation materials/systems and protection classes — Inverters and engine controllers (construction, inverter topologies and function) — Integration of engine, controller, and gearbox 	3
18.4	18.4.1 Batteries and accessories:	<ul style="list-style-type: none"> — Battery types used in aviation (Li-ion, LiPo, solid state — overview) — Cell, module, and pack architecture — Battery management systems (BMSs): functions (SOC, SOH, etc.) and protections — Charging systems and charging modes — Thermal management and cooling systems — Battery protection devices (contactors, fuses, isolation monitoring, thermal monitoring) — Battery hazards: thermal runaway, overcharge, deep discharge 	3
18.4	18.4.2 Fuel cells and accessories:	<ul style="list-style-type: none"> — Principles of fuel cell operation — Types of fuel cells applicable to aviation — Balance of plant components <ul style="list-style-type: none"> — Hydrogen storage concepts (overview) — Integration with electric power plant systems 	3

18.4	18.4.3 Power distribution systems:	<ul style="list-style-type: none"> — High-voltage and low-voltage architectures — DC and AC distribution concepts — Power cables, connectors, and shielding — Contactors, relays, circuit protection, and isolation — Grounding and bonding requirements — Redundancy and fault-tolerant design principles 	3
18.4	18.4.4 Electronic engine control:	<ul style="list-style-type: none"> — Control laws and operating modes — Sensor inputs (temperature, speed, current, voltage) — Fault detection and protection logic — Software and configuration control (overview) 	3
18.5	18.5 Engine indication systems:	<ul style="list-style-type: none"> — Power, torque, and speed indications — Voltage, current, and battery state-of-charge indications — Temperature monitoring (engine, inverter, batteries) — Warning, caution, and advisory systems — Failure indications and pilot alerts 	3
18.6	18.6 Power plant installation:	<ul style="list-style-type: none"> — Installation requirements for electric engines — Mounting, alignment, and vibration considerations — Cooling system installation — Electrical harness routing and protection — EMC/EMI considerations — Grounding and bonding requirements 	3
18.7	18.7 Engine monitoring and ground operation:	<ul style="list-style-type: none"> — Pre-flight and post-flight checks — Power-up and shutdown procedures — Ground operation limitations — Monitoring of system parameters during operation — Abnormal operation and fault handling — Safety procedures for maintenance personnel 	3
18.7	18.8 Engine storage and preservation:	<ul style="list-style-type: none"> — Storage requirements for electric engines — Battery storage conditions and state-of-charge management — Long-term preservation procedures — Depreservation after storage — Environmental considerations (humidity, temperature, contamination) 	3