

	<b>PHL CAR-147 (Basic)</b> <b>F/o Engineering and Technology ,Jamia Millia Islamia</b> <b>B.Sc (Aeronautics)</b> <b>Subject: Aircraft Structure and Associated Systems</b>	Credits (T)-04
		Sub Code : C 1

### Theory

- C1.1 Introduction to General term and vocabulary used in Aeronautical science**  
Introduction to aircraft technical literature.  
Introduction to ATA system
- C1.2 Introduction to aircraft, major aircraft components, aircraft systems and their functions, reference lines, station and zone identification systems**
- C1.3 Airframe Structures — General Concepts**  
Airworthiness requirements for structural strength; Structural classification, primary, secondary and tertiary; Fail safe, safe life, damage tolerance concepts; Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue; Lightning strike protection provision. Drains and ventilation provisions, System installation provisions Aircraft bonding and continuity. 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; Describe current practice in aircraft design related to load transfer, load path continuity and reduction of stress raisers in pressurized fuselages.
- C1.4 Fasteners used on aircraft**  
**Fasteners, Screw threads**  
Screw nomenclature; Thread forms, dimensions and tolerances for standard threads used in aircraft; measuring screw threads;  
**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.  
**Aircraft rivets**  
Types of solid and blind rivets: specifications and identification, heat treatment.  
**Riveting**  
Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.
- C1.5 Structural Assembly**  
Structural assembly techniques: riveting, bolting, bonding methods of surface protection, such as chromating, anodising, painting; Surface cleaning. Airframe symmetry: methods of alignment and symmetry checks. Complete airframe for symmetry fuselage for twist and bending, vertical stabiliser for alignment wings and horizontal stabilisers for dihedral and incidence
- C1.6 Airframe Structures — Aeroplane**  
Fuselage (ATA 52/53/56) :Construction and pressurisation sealing; Wing, stabiliser, 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.

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**C1.7 Wings (ATA 57)**

Anhedral, dihedral incidence angle interplane struts longitudinal dihedral rigging position, stagger, wash in, washout Construction; Fuel storage; Landing gear, pylon, control surface and high lift/drag attachments.

**C1.8 Stabilizers**

Construction; Control surface attachment.

**C1.9 Flight Control Surfaces (ATA 55/57)**

Construction and attachment; Balancing — mass and aerodynamic.

**C1.10 Nacelles/Pylons (ATA 54)**

Construction; Firewalls; Engine mounts.

**Reference Books:**

Dictionary of Aeronautical terms (Dale Crane)

Aircraft handbook FAA ( AC 65-15 A )

Aircraft structure Ch. 01 ( FAA )

Aircraft Construction Repair and Inspection-By Joe Christy

Aviation Maintenance Technician Hand book by FAA

Aircraft Maintenance and Repair- Delp/Bent/McKinley, AC 43.1B

	<b>PHL CAR-147 (Basic)</b> <b>F/o Engineering and Technology ,Jamia Millia Islamia</b> <b>B.Sc (Aeronautics)</b> <b>Subject: GAS TURBINE ENGINE-I</b>	<b>Credits (T)-04</b>
		<b>Sub Code : C 7</b>

## Theory

### **C7.1 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.

### **C7.2 Engine Performance**

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.

### **C7.3 Inlet**

Compressor inlet ducts; Effects of various inlet configurations; Ice protection.

### **C7.4 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.

### **C7.5 Combustion Section**

Constructional features and principles of operation

### **C7.6 Turbine Section**

Operation and characteristics of different turbine blade types; Blade to disk attachment; Nozzle guide vanes; Causes and effects of turbine blade stress and creep.

### **C7.7 Exhaust**

Constructional features and principles of operation Convergent, divergent and variable area nozzles; Engine noise reduction; Thrust reversers.

### **C7.8 Bearings and Seals**

Constructional features and principles of operation and handling.

### **C7.9 Lubricants and Fuels**

Properties and specifications; Fuel additives; Safety precautions

### **C7. 10 Lubrication Systems**

System operation/lay-out and components.

### **C7.11 Fuel Systems**

Operation of engine control and fuel metering systems including electronic engine control (FADEC) Systems lay-out and components.

### **Reference Books:**

Aircraft Gas Turbine Technology by IRWINE TREAGER  
The Jet Engine' by ROLLS ROYCE

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Power plant Section Text book- (EA-ITP-P)  
Aviation Maintenance Technician Series by Dale Crane  
Jet Aircraft power Systems' by JACK V. CASAMASSA and RALPH D.BENT  
Gas Turbine Engines' by Turbomeca, Bordes,France.  
Hydraulic Servo Systems' by M.GUILLON  
Introduction to Flight by JOHN ANDERSON:  
Civil Aircraft Inspection Procedure (CAP459) Part- II  
Aircraft Aircraft Power Plants by M.J.KROES, T.W.Wild, R.D.Bent and J.L.McKINLEY;

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		Sub Code : C10

### Theory

- C10.1 **Aircraft Weight and Balance**  
(a) Centre of Gravity/Balance limits calculation: use of relevant documents;  
(b) Preparation of aircraft for weighing; Aircraft weighing;
- C10.2 **Aircraft Handling and Storage**  
**Aircraft taxiing/towing and associated safety precautions; Aircraft jacking,**  
chocking, securing and associated safety precautions; Aircraft storage methods;  
Refuelling /defueling procedures; De-icing/anti-icing procedures; Electrical,  
hydraulic and pneumatic ground supplies. Effects of environmental conditions on aircraft  
handling and operation.
- C10.3 **Pneumatic/Vacuum (ATA 36)**  
System lay-out; Sources: engine/APU, compressors, reservoirs, ground supply;  
Pressure control; Distribution; Indications and warnings; Interfaces with other  
systems.
- C10.4 **Air Conditioning and Cabin Pressurization (ATA 21)**  
Air supply- Sources of air supply including engine bleed, APU and ground cart;  
Air Conditioning- Air conditioning systems; Air cycle and vapour cycle machines  
Distribution systems; Flow, temperature and humidity control system.  
Pressurization - Pressurization systems; Control and indication including control  
and safety valves;  
Cabin pressure controllers. Safety and warning devices; Protection and warning  
devices.
- C10.5 **Equipment and Furnishings (ATA 25)**  
Emergency equipment requirements; Seats, harnesses and belts, electronic  
emergency equipment requirements  
Cabin lay-out, cargo retention; Equipment lay-out; Cabin Furnishing Installation;  
Cabin entertainment equipment; Galley installation; Cargo handling and retention  
equipment;  
Airstairs. Lifting system; Emergency flotation systems;
- C10.6 **Flight Controls (ATA 27)**  
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  
locks systems; Balancing and rigging; Stall protection/warning system.
- C10.7 **Fuel Systems (ATA 28)**  
System lay-out; Fuel tanks; Supply systems; Dumping, venting and draining; Crossfeed and  
transfer; Indications and warnings; Refuelling and defueling; Longitudinal balance fuel  
systems.
- C10.8 **Hydraulic Power (ATA 29)**  
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.
- C10.9 **Ice and Rain Protection (ATA 30)**

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		<b>Sub Code : C10</b>

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

**C10.10 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; Skids, floats

**C10.11 Abnormal Events (ATA 05)**

(a) Inspections following lightning strikes and HIRF penetration.

(b) Inspections following abnormal events such as heavy landings and flight through turbulence.

**Reference Books:**

Airframe and Powerplant Mechanics (AC 65-15A) -Airframe Hand Book FAA

Civil Aircraft Inspection Procedure (CAP 459) Part II Aircraft

A & P technician Air Frame Text Book by Jeppesen

Aircraft Repair Manual (FAA-AC-43.13)-By Larry Reithmaier

Aviation Maintenance Technician Hand book by FAA

Hydraulic Servo Systems by M. GUILLON:

Aircraft Instruments-by E.H.J.Pallett

Aircraft Electrical System-by E.H.J.Pallett

	<b>PHL CAR-147 (Basic)</b> <b>F/o Engineering and Technology ,Jamia Millia Islamia</b> <b>B.Sc (Aeronautics)</b> <b>Subject: Piston Engine and Propeller</b>	<b>Credits (T)-04</b>
		<b>Sub Code :</b> <b>DSE1</b>

### Theory

- DSE1.1 **Fundamentals**  
Mechanical, thermal and volumetric efficiencies operating principles , 2 stroke, 4 stroke, Otto and Diesel, Piston displacement and compression ratio; Engine configuration and firing order.
- DSE1.2 **Engine Performance**  
Power calculation and measurement; Factors affecting engine power; Mixtures/leaning, pre-ignition.
- DSE1.3 **Engine Construction**  
Crank case, crank shaft, cam shafts, sumps; Accessory gearbox; Cylinder and piston assemblies; Connecting rods, inlet and exhaust manifolds; Valve mechanisms; Propeller reduction gearboxes.
- DSE1.4 **Engine Fuel Systems**  
Carburettors Types, construction and principles of operation; Icing and heating
- DSE1.5 **Fuel injection systems**  
Types, construction and principles of operation.
- DSE1.6 **Electronic engine control**  
Operation of engine control and fuel metering systems including electronic engine control (FADEC); Systems lay-out and components
- DSE1.7 **Starting and Ignition Systems**  
Starting systems, pre-heat systems; Magneto types, construction and principles of operation; Ignition harnesses, spark plugs; Low and high tension systems
- DSE1.8 **Induction, Exhaust and Cooling Systems**  
Construction and operation of: induction systems including alternate air systems; Exhaust systems, engine cooling systems — air and liquid.
- DSE1.9 **Supercharging/Turbocharging**  
Principles and purpose of supercharging and its effects on engine parameters. Construction and operation of supercharging/ turbocharging systems; System terminology; Control systems; System protection.
- DSE1.10 **Lubricants and Fuels**  
Properties and specifications; Fuel additives; Safety precautions
- DSE1.11 **Lubrication Systems**  
System operation/lay-out and components.
- DSE1.12 **Engine Indication Systems**  
Engine speed; Cylinder head temperature; Coolant temperature; Oil pressure and temperature; Exhaust Gas Temperature; Fuel pressure and flow; Manifold pressure.
- DSE1.13 **Powerplant Installation**  
Configuration of firewalls, cowlings, acoustic panels, engine mounts, antivibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains
- DSE1.14 **Engine Monitoring and Ground Operation**  
Procedures for starting and ground run-up; Interpretation of engine power output and parameters; Inspection of engine and components: criteria, tolerances, and data specified by engine manufacturer.
- DSE1.15 **Engine Storage and Preservation**  
Preservation and de-preservation for the engine and accessories/ systems

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		<b>Sub Code :</b> <b>DSE1</b>

**DSE1.16 Aircraft Propeller**

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.

**DSE1.17 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 speed propeller; Propeller/spinner installation.

**DSE1.18 Propeller Pitch Control**

Speed control and pitch change methods, mechanical and electrical/electronic; Feathering and reverse pitch; Over speed protection.

**DSE1.19 Propeller Synchronising**

Synchronising and synchrophasing equipment.

**DSE1.20 Propeller Ice Protection**

Fluid and electrical de-icing equipment.

**DSE1.21 Propeller Maintenance**

Static and dynamic balancing; Blade tracking; Assessment of blade damage, erosion, corrosion, impact damage, delamination; Propeller treatment/repair schemes; Propeller engine running.

**DSE1.22 Propeller Storage and Preservation**

Propeller preservation and de-preservation.

**Reference Books:**

Airframe and Power plant Mechanics (EA-AC 65- 12A) -Power Plant Hand FAA  
 Power Plant-By Bent and McKinley  
 Civil Aircraft Inspection Procedure (CAP 459) Part II Aircraft  
 Aircraft Propeller and Controls-by Frank Delph  
 Powerplant Section Text book- (EA-ITP-P)  
 Aircraft Piston Engines-By Herschel Smith  
 Aviation Maintenance Technician Series by Dale Crane

	<b>PHL CAR-147 (Basic)</b> <b>F/o Engineering and Technology ,Jamia Millia Islamia</b> <b>B.Sc (Aeronautics)</b> <b>Subject: Rotorcraft And Rotorcraft Autopilot-II</b>	<b>Credits (T)-04</b>
		<b>Sub Code :</b> <b>DSE2</b>

- DSE2.4 **Power Units and Flight Performance**  
Piston engines, Gas turbines, Ramjet principle, gross weight of a jet helicopter, Comparative performance, and Horse power required, Range and Endurance, rate of climb, best climbing speed, Ceiling in vertical climb, Autorotation.
- DSE2.5 **Dynamic Stability and Control**  
Physical description of effects of disturbances, longitudinal dynamic stability, Stick fixed dynamic stability, longitudinal stability characteristics, lateral dynamic stability, lateral stability characteristics, control response.
- DSE2.6 **Rotor Vibrations**  
Dynamic model of the rotor, motion of the rigid blades, flapping motion, lagging motion, feathering motion, properties of vibrating systems, phenomenon of vibrations, fuselage response, Vibration absorbers, Measurement of vibration in flight, Vibration indicating systems — HUMS
- DSE2.7 **Blade Tracking and Vibration Analysis**  
Rotor alignment;  
Main and tail rotor tracking;  
Static and dynamic balancing;  
Vibration types, vibration reduction methods;  
Ground resonance
- DSE2.8 **Rotor Blade Design**  
General considerations, Airfoil selection, blade constructions, materials, factors affecting weight and cost, Design conditions, stress analysis.
- DSE2.9 **Transmissions**  
Gear boxes, main and tail rotors;  
Clutches, free wheel units and rotor brake.  
Tail rotor drive shafts, flexible couplings, bearings, vibration dampers and bearing hangers
- DSE2.10 **Rotorcraft Autopilot**  
Helicopter AFCS, autopilots/yaw dampers, flight director systems and stability augmentation system (SAS), Sensors (raw data) Computer, Controller (mode selector), Loads (command bars and autopilot), and Functioning

Reference books:

Young R.A, "Helicopter Engineering".

Bramwell, A.R.S, "Helicopter Dynamics".

Jacob Shapiro, "Principles of Helicopter Engineering".