



**PILOTS' TECHNICAL EXAMINATION SYLLABUS
FOR
PPL, CPL, ATPL, IR & FIR
(AEROPLANES & HELICOPTERS)**

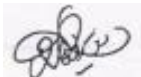
CIVIL AVIATION AUTHORITY, BANGLADESH

DIRECTORATE OF FLIGHT SAFETY & REGULATIONS

This volume of the document has been prepared with a view to outlining Pilots' Technical Examination Syllabus for issue of Private Pilot Licence (PPL), Commercial Pilot Licence (CPL), Airline Transport Pilot Licence (ATPL), Instrument Rating (IR) and Flight Instructor Licence (FIR) for Aeroplanes and Helicopters.

The document contains all the relevant Subjects and associated Syllabi that an applicant should be conversant with and shall be able to demonstrate the level of knowledge appropriate to the privileges granted to the holder of each type of licence and rating mentioned above.

Comments and recommendations for revision/amendment action to this document should be directed to Director Flight Safety & Regulations.



**Chairman
Civil Aviation Authority
Bangladesh**

RECORD OF AMENDMENTS

Amendment Number	Date	Pages Affected	Date Entered	Initials

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**PILOTS' TECHNICAL EXAMINATION SYLLABUS FOR
PPL
(AEROPLANES/HELICOPTERS)**

PILOTS' TECHNICAL EXAMINATION SYLLABUS FOR PPL (AEROPLANES/HELICOPTERS)

INTRODUCTION

As depicted in Rule 23(b)/28(b) of CAR '84 (Part-1), an applicant, for issue of Private Pilot Licence for Aeroplane/Helicopter, shall have passed at list Secondary School Certificate Examination or its Equivalent and shall have passed a written Examination conducted by Civil Aviation Authority, Bangladesh in the subjects and associated syllabi thereof. The subjects are :

1. AIR LAW
2. AIRCRAFT GENERAL KNOWLEDGE
3. FLIGHT PERFORMANCE & PLANNING
4. HUMAN PERFORMANCE AND LIMITATIONS
5. METEOROLOGY
6. NAVIGATION
7. OPERATIONAL PROCEDURES
8. PRINCIPLES OF FLIGHT
9. RADIOTELEPHONY

The syllabus for each subject shall supersede all syllabi issued before in this context. No alteration shall be allowed in the syllabus or in the examination details mentioned below, without the approval of Chairman, CAAB.

Before imparting lessons to the trainees, all authorized Training Institutions/Organizations/Operators etc, shall prepare 'Lesson Plans' on the syllabus of each subject and shall get the same approved by CAAB.

Examinations are to be conducted out of 50 Marks for each of Operations Procedures & Radiotelephony and out of 100 Marks for each of the remaining subjects.

Examination Papers for each subject shall contain a few **Descriptive** (about 20% of the full marks), **Multiple Choices** (about 60% of the full marks), **True/False** (about 10% of the full marks) and **Fill in the Blanks** (about 10% of the full marks).

1. AIR LAW

Pilots shall be conversant with the rules and regulations, rules of the air and appropriate air traffic services practices and procedures relevant to the holder of a Private Pilot Licence for Aeroplane/Helicopter.

SYLLABUS

Legislation

- 1 The Convention on International Civil Aviation
- 2 The International Civil Aviation Organisation
- 3 Articles of the Convention
 - Sovereignty
 - Territory
 - Flight over territory of Contracting States
 - Landings at customs airports
 - Applicability of air regulations
 - Rules of the air
 - Entry and clearance regulations of Contracting States
 - Search of aircraft

- Facilitation of formalities
 - Customs and immigration procedures
 - Customs duty
 - Documents to be carried in aircraft
 - Use of aircraft radio equipment
 - Certificate of airworthiness
 - Licences of air personnel
 - Recognition of certificates and licenses
 - Journey log books
 - Cargo restrictions
 - Restrictions on use of photographic equipment
 - Adoption of international standards and procedures
 - Endorsements of certificates and licences
 - Validity of endorsed certificates and licences
4. Annexes to the Convention ('ICAO Annexes')
- Annex 7 Aircraft nationality and registration marks
- Definitions
 - Aircraft registration marks
 - Certificate of registration
 - Identification plate
5. Annex 8 Airworthiness of aircraft
- Definitions
 - Certificate of airworthiness
 - Continuing airworthiness
 - Validity of certificate of airworthiness
 - Instruments and equipment
 - Aircraft limitations and information

Rules of the air

6. Annex 2 Rules of the air
- Definitions
 - Applicability
 - General rules
 - Visual flight rules
 - Signals (Appendix 1)
 - Interception of civil aircraft (Appendix 2)

Air traffic regulations and air traffic services

7. Annex 11 Air traffic regulations and air traffic services
- Definitions
 - Objectives of air traffic services
 - Classification of airspace
 - Flight information regions, control areas and control zones
 - Air traffic control services
 - Flight information services
 - Alerting service
 - Visual meteorological conditions
 - Instrument meteorological services
 - In-flight contingencies

8. Annex 14 Aerodrome data
 - definitions
 - conditions of the movement area and relevant facilities
 - Visual aids for navigation
 - indicators and signalling devices
 - markings
 - lights
 - signs
 - markers
 - signal area
 - Visual aids for denoting obstacles
 - marking of objects
 - lighting of objects
 - Visual aids for denoting restricted use of areas
 - Emergency and other services
 - fire and rescue service
 - apron management service
 - Aerodrome ground lights and surface marking colours
 - colours for aeronautical ground lights
 - colours for surface markings]
9. ICAO Document 4444 – Rules of the air and air traffic services
 - General provisions
 - Definitions
 - ATS operating practices
 - Flight plan clearance and information
 - Control of air traffic flow
 - Altimeter setting procedures
 - Wake turbulence information
 - Meteorological information
 - Air reports (AIREP)
 - Area control service
 - Separation of controlled traffic in the various classes of airspace
 - Pilots' responsibility to maintain separation in VMC
 - Emergency and communications failure procedures by the pilot
 - Interception of civil aircraft
 - Approach control service
 - Departing and arriving aircraft procedures in VMC
 - Aerodrome control service
 - Function of aerodrome control towers
 - VFR operations
 - Traffic and circuit procedures
 - Information to aircraft
 - Control of aerodrome traffic
 - Flight information and alerting service
 - Air traffic advisory service
 - Objectives and basic principles

2. AIRCRAFT GENERAL KNOWLEDGE

- (a) Pilots of aeroplanes shall be conversant with,
- (i). Principles of operation of aeroplane powerplants, systems and instruments and,
 - (ii). Operating limitations of aeroplanes and powerplants; relevant operational information from the flight manual or other appropriate document, relevant to the holder of a Private Pilot Licence for Aeroplane.
- (b) Pilots of helicopters shall be conversant with,
- (i) Principles of operation of helicopter powerplants, transmission (power- trains), systems and instruments and,
 - (ii) Operating limitations of helicopters and powerplants, relevant operational information from the flight manual, relevant to the holder of a Private Pilot Licence for Helicopter.

SYLLABUS**Airframe**

1. Airframe structure
 - Components
 - Fuselage, wings, tail plane, fin
 - Primary flying controls
 - Trim and flap/slat systems
 - Landing gear
 - nose wheel, including steering
 - tyres' condition
 - braking systems and precautions in use
 - retraction systems
2. Airframe loads
 - Static strength
 - safety factor
 - control locks and use
 - ground/flight precautions

Power plant

3. Engines -general
 - principles of the four stroke internal combustion engine
 - basic construction
 - causes of pre-ignition and detonation
 - power output as a function of RPM
4. Engine cooling
 - air cooling
 - cowling design and cylinder baffles
 - design and use of cowl flaps
 - cylinder head temperature gauge

5. Engine lubrication
 - function and methods of lubrication
 - lubrication systems
 - methods of oil circulation
 - oil pump and filter requirements
 - qualities and grades of oil
 - oil temperature and pressure control
 - oil cooling methods
 - recognition of oil system malfunctions
6. Ignition systems
 - principles of magneto ignition
 - construction and function
 - purpose and principle of impulse coupling
 - serviceability checks, recognition of malfunctions
 - operational procedures to avoid spark plug fouling
7. Carburetion
 - principles of float type carburetor
 - construction and function
 - methods to maintain correct mixture ratio
 - operation of metering jets and accelerator pump
 - effect of altitude
 - manual mixture control
 - maintenance correct mixture ratio
 - limitation on use at high power
 - avoidance of detonation
 - idle cut-off valve
 - operation and use of primary controls
 - air induction system
 - alternate induction systems
 - carburetor icing, use of hot air
 - injection systems, principles and operation
8. Aero engine fuel
 - classification of fuels
 - grades and identification by color
 - quality requirements
 - inspection for contamination
 - use of fuel strainers and drains
9. Fuel systems
 - fuel tanks and supply lines
 - venting system
 - mechanical and electrical pumps
 - gravity feed
 - tank selection
 - system management

10. Propellers
 - propeller nomenclature
 - conversion of engine power to thrust
 - design and construction of fixed pitch propeller
 - forces acting on propeller blade
 - variation of RPM with change of airspeed
 - thrust efficiency with change of speed
 - design and construction of variable pitch propeller
 - constant speed unit operation
 - effect of blade pitch changes
 - wind milling effect
11. Engine handling
 - starting procedures and precautions
 - recognition of malfunctions
 - warming up, power and system checks
 - oil temperature and pressure limitations
 - cylinder head temperature limitations
 - ignition and other system checks
 - power limitations
 - avoidance of rapid power changes
 - use of mixture control

Systems

12. Electrical system
 - installation and operation of alternators/generators
 - direct current supply
 - batteries, capacity and charging
 - voltmeters and ammeters
 - circuit breakers and fuses
 - electrically operated services and instruments
 - recognition of malfunctions
 - procedure in the event of malfunctions
13. Vacuum system
 - components
 - pumps
 - regulator and gauge
 - filter system
 - recognition of malfunction
 - procedures in the event of malfunctions

Instruments

14. Pitots/static system
 - pitot tube, function
 - pitot tube, principles and construction
 - static source
 - alternate static source
 - position error
 - system drains
 - heating element
 - errors caused by blockage or leakage

15. Airspeed indicator
 - principles of operation and construction
 - relationship between pitot and static pressure
 - definitions of indicated, calibrated and true airspeed
 - instrument errors
 - airspeed indications, colour coding
 - pitot's serviceability checks

16. Altimeter
 - principles of operation and construction
 - function of the sub-scale
 - effects of atmospheric density
 - pressure altitude
 - international standard atmosphere

17. Vertical speed indicator
 - principles of operation and construction
 - function
 - inherent lag
 - instantaneous VSI
 - presentation
 - pilot's serviceability checks

18. Gyroscopes
 - principles
 - rigidity
 - precession

19. Turn indicator
 - rate gyro
 - purpose and function
 - effect of speed
 - presentation
 - turn co-ordinator
 - limited rate of turn indications
 - power source
 - balance indicator
 - principle
 - presentation
 - pitot's serviceability checks

20. Attitude indicator
 - earth gyro
 - purpose and function
 - presentations
 - interpretation
 - operating limitations
 - power source
 - pilot's serviceability checks

21. Heading indicator
 - directional gyro
 - purpose and function
 - presentation
 - use with magnetic compass
 - setting mechanism
 - apparent drift
 - operating limitations
 - power source
 - pilot's serviceability checks

22. Magnetic compass
 - construction and function
 - earth's magnetic field
 - verification and deviation
 - turning, acceleration errors
 - precautions when carrying magnetic items
 - pilot's service ability checks

23. Engine instruments
 - principles, presentation and operational use of :
 - oil temperature gauge
 - oil pressure gauge
 - cylinder head temperature gauge
 - exhaust gas meter
 - manifold pressure gauge
 - fuel pressure gauge
 - fuel flow gauge
 - fuel quantity gauge(s)
 - tachometer

24. Other instruments
 - principles, presentation and operational use of
 - vacuum gauge
 - voltmeter and ammeter
 - warning indicators
 - others relevant to aeroplane type

Airworthiness

25. Airworthiness
 - certificate to be in force
 - compliance with requirements
 - periodic maintenance inspections
 - compliance with flight manual (or equivalent), instructions, limitations, placards
 - flight manual supplements
 - provision and maintenance of documents
 - aeroplane, engine and propeller log books
 - recording of defects
 - permitted maintenance by pilots

3. FLIGHT PERFORMANCE & PLANNING

Pilots shall be conversant with the following for knowledge and aptitude on Flight performance & Planning relevant to the holder of a Private Pilot Licence for Aeroplane/Helicopter :-

- (a) Effects of loading and mass distribution on flight characteristics; mass and balance calculations,
- (b) Use and practical application of take-off, landing and other performance data,
- (c) Pre-flight and en-route flight planning appropriate to private operations under VFR; preparation and filing of air traffic services flight plans; appropriate air traffic services procedures; position reporting procedures; altimeter setting procedures; operations in areas of high-density traffic,

SYLLABUS

Mass and balance

1. Mass and balance
 - limitations on maximum mass
 - forward and aft limitations of centre of gravity, normal and utility operation
 - mass and centre of gravity calculations – aeroplane manual and balance sheet

Performance

2. Take- off
 - take –off run and distance available
 - take-off and initial climb
 - effects of mass, wind and density altitude
 - effects of ground surface and gradient
 - use of flaps
3. Landing
 - effects of mass, wind, density altitude and approach speed
 - use of flaps
 - ground surface and gradient
4. In flight
 - relationship between power required and power available
 - performance diagram
 - maximum rate and maximum angle of climb
 - range and endurance
 - effects of configuration, mass, temperature and altitude
 - reduction of performance during climbing turns
 - gliding
 - adverse effects
 - icing, rain
 - condition of the airframe
 - effect of flap

4. HUMAN PERFORMANCE AND LIMITATIONS

Pilots shall be conversant with the Human Performance and Limitations relevant to the holder of a Private Pilot Licence for Aeroplane/Helicopter.

SYLLABUS

Basic physiology

1. Concepts
 - composition of the atmosphere
 - the gas laws
 - respiration and blood circulation
2. Effects of partial pressure
 - effects of increasing altitude
 - gas transfer
 - hypoxia
 - symptoms
 - prevention
 - cabin pressurization
 - effects of rapid decompression
 - time of useful consciousness
 - the use of oxygen masks and rapid descent
 - hyperventilation
 - symptoms
 - avoidance
 - effects of accelerations
3. Vision
 - physiology of vision
 - limitations of the visual system
 - vision defects
 - optical illusions
 - spatial disorientation
 - avoidance of disorientation
4. Hearing
 - physiology of hearing
 - inner ear sensations
 - effects of altitude change
 - noise and hearing loss
 - protection of hearing
 - spatial disorientation
 - conflicts between ears and eyes
 - prevention of disorientation
5. Motion sickness
 - causes
 - symptoms
 - prevention

6. Flying and health
 - medical requirements
 - effect of common ailments and cures
 - colds
 - stomach upsets
 - drugs, medicines, and side effects
 - alcohol
 - fatigue
 - personal fitness
 - passenger fitness
 - passenger care
 - scuba diving – precautions before flying

7. Toxic hazards
 - dangerous goods
 - carbon monoxide from heaters

Basic psychology

8. The information process
 - concepts of sensation
 - cognitive perception
 - expectancy
 - anticipation
 - habits

9. The central decision channel
 - mental workload, limitations
 - information sources
 - stimuli and attention
 - verbal communication
 - memory and its limitations
 - causes of misinterpretation

10. Stress
 - causes and effects
 - concepts of arousal
 - effects on performance
 - identifying and reducing stress

11. Judgment and decision making
 - concepts of pilots judgment
 - psychological attitudes
 - behavioural aspects
 - risk assessment
 - development of situational awareness

5. METEOROLOGY

Pilots shall be conversant with the application of elementary aeronautical meteorology; use of and procedures for obtaining, meteorological information; altimetry relevant to the holder of a Private Pilot Licence for Aeroplane/Helicopter.

SYLLABUS

1. The atmosphere
 - composition and structure
 - vertical divisions

2. Pressure, density and temperature
 - barometric pressure, isobars
 - changes of pressure, density and temperature with altitude
 - altimetry terminology
 - solar and terrestrial energy radiation, temperature
 - diurnal variation of temperature
 - adiabatic process
 - temperature lapse rate
 - stability and instability
 - effects of radiation, advection subsidence and convergence

3. Humidity and precipitation
 - water vapour in the atmosphere
 - vapour pressure
 - dew point and relative humidity
 - condensation and vaporization
 - precipitation

4. Pressure and wind
 - high and low pressure areas
 - motion of the atmosphere, pressure gradient
 - vertical and horizontal motion, convergence, divergence
 - surface and geostrophic wind
 - effect of wind gradient and windshear on take-off and landing
 - relationship between isobars and wind, Buys Ballot's law
 - turbulence and gustiness
 - local winds, fohn, land and sea breezes

5. cloud formation
 - cooling by advection, radiation and adiabatic expansion
 - cloud types
 - convection clouds
 - orographic clouds
 - stratiform and cumulus clouds
 - flying conditions in each cloud type

6. Fog, mist and haze
 - radiation, advection, frontal, freezing fog
 - formation and dispersal
 - reduction of visibility due to mist, snow, smoke, dust and sand
 - assessment of probability of reduce visibility
 - hazards in flight due to low visibility, horizontal and vertical

7. Air-masses
 - description of and factors affecting the properties of air-masses
 - classification of air-masses, region of origin
 - modification of air-masses during their movement
 - development of low and high pressure systems
 - weather associated with pressure systems

8. Frontology
 - formation of cold and warm fronts
 - boundaries between air-masses
 - development of a warm front
 - associated clouds and weather
 - weather in the warm sector
 - development of a cold front
 - associated clouds and weather
 - occlusions
 - associated clouds and weather
 - stationary fronts
 - associated clouds and weather

9. Ice accretion
 - conditions conducive to ice formation
 - effects of hoar frost, rime ice, clear ice
 - effects of icing on aeroplane performance
 - precautions and avoidance of icing conditions
 - powerplant icing
 - precautions, prevention and clearance of induction and carburetor icing

10. Thunderstorms
 - formation – airmass, frontal, orographic
 - conditions required
 - development process
 - recognition of favourable conditions for formation
 - hazards for aeroplanes
 - effects of lightning and severe turbulence
 - avoidance of flight in the vicinity of thunderstorms

11. Flight over mountainous areas
 - hazards
 - influence of terrain on atmospheric processes
 - mountain waves, windshear, turbulence, vertical movement, rotor effects, valley winds

12. Climatology
 - local seasonal weather and winds
13. Altimetry
 - operational aspects of pressure settings
 - pressure altitude, density altitude
 - height, altitude, flight level
 - ICAO standard atmosphere
 - QNH, QFE, standard setting
 - transition altitude, layer and level
14. The meteorological organization
 - aerodrome meteorological offices
 - aeronautical meteorological stations
 - forecasting service
 - meteorological services at aerodromes
 - availability of periodic weather forecasts
15. Weather analysis and forecasting
 - weather charts, symbols, signs
 - significant weather charts
 - prognostic charts for general aviation
16. Weather information for flight planning
 - reports and forecasts for departure, en-route, destination and alternate(s)
 - interpretation of coded information METAR, TAF, GAFOR
 - availability of ground reports for surface wind, windshear, visibility
17. Meteorological broadcasts for aviation
 - VOLMET, ATIS, SIGMET

6. NAVIGATION

Pilots shall be conversant with practical aspects of air navigation and dead-reckoning techniques, use of aeronautical charts relevant to holder of a Private Pilot Licence for Aeroplane/Helicopter.

SYLLABUS

1. Form of the earth
 - axis, poles
 - meridians of longitude
 - parallels of latitude
 - great circles, small circles, rhumb lines
 - hemispheres, north/south, east/west
2. Mapping
 - aeronautical maps and charts (topographical)
 - projections and their properties
 - conformality
 - equivalence
 - scale
 - great circles and rhumb lines
3. Conformal orthomorphic projection (ICAO 1:500,000 chart)
 - main properties
 - construction
 - convergence of meridians
 - presentation of meridians, parallels, great circles and rhumb lines
 - scale, standard parallels
 - depiction of height
4. Direction
 - true north
 - earth's magnetic field, variation – annual change
 - magnetic north
 - vertical and horizontal components
 - isogonals, agonic lines
5. Aeroplane magnetism
 - magnetic influences within the aeroplane
 - compass deviation
 - turning, acceleration errors
 - avoiding magnetic interference with the compass
6. Distances
 - units
 - measurement of distance in relation to map projection

7. Charts in practical navigation
 - plotting positions
 - latitude and longitude
 - bearing and distance
 - use of navigation protractor
 - measurement of tracks and distances

8. Chart reference material/map reading
 - map analysis
 - topography
 - relief
 - cultural features
 - permanent features (e.g. line features, spot features, unique or special features)
 - features subject to change (e.g. water)
 - preparation
 - folding the map for use
 - methods of map reading
 - map orientation
 - checkpoint features
 - anticipation of checkpoints
 - with continuous visual contact
 - without continuous visual contact
 - when uncertain of position
 - aeronautical symbols
 - aeronautical information
 - conversion of units

9. Principles of navigation
 - IAS, CAS and TAS
 - track, true and magnetic
 - wind velocity, heading and groundspeed
 - triangle of velocities
 - calculation of heading and groundspeed
 - drift, wind correction angle
 - ETA
 - dead reckoning, position, fix

10. The navigation computer
 - use of the circular slide rule to determine
 - TAS, time and distance
 - conversion of units
 - fuel required
 - pressure, density and true altitude
 - time en-route and ETA
 - use of the computer to solve triangle of velocities
 - application of TAS wind velocity to track
 - determination of heading and ground speed
 - drift and wind correction angle

11. Time
 - relationship between universal co-ordinated (standard) (UTC) time and local mean time (LMT)
 - definition of sunrise and sunset times

12. Flight planning
 - selection of charts
 - route and aerodrome weather forecasts and reports
 - assessing the weather situation
 - plotting the route
 - considerations of controlled/regulated airspace, airspace restrictions, danger areas, etc.
 - use of AIP and NOTAMS
 - ATC liaison procedures in controlled/regulated airspace
 - fuel considerations
 - en-route safety altitude(s)
 - alternate aerodromes
 - communications and Radio/Nav aid frequencies
 - compilation of flight log
 - compilation of ATC flight plan
 - selection of check points, time and distance marks
 - mass and balance calculations
 - mass and performance calculations

13. Practical navigation
 - compass headings, use of deviation card
 - organisation of in-flight workload
 - departure procedure, log entries, altimeter setting and establishing IAS
 - maintenance of heading and altitude
 - use of visual observations
 - establishing position, checkpoints
 - revisions to heading and ETA
 - arrival procedures, ATC liaison
 - completion of flight log and aeroplane log entries

Radio navigation

14. Ground D/F
 - application
 - principles
 - presentation and interpretation
 - coverage
 - errors and accuracy
 - factors affecting range and accuracy

15. ADF, including associated beacons (NDBs) and use of the RMI
 - application
 - principles
 - presentation and interpretation
 - coverage
 - errors and accuracy
 - factors affecting range and accuracy

16. VOR/DME
 - application
 - principles
 - presentation and interpretation
 - coverage
 - errors and accuracy
 - factors affecting range and accuracy

17. GPS
 - application
 - principles
 - presentation and interpretation
 - coverage
 - errors and accuracy
 - factors affecting reliability and accuracy

18. Ground radar
 - application
 - principles
 - presentation and interpretation
 - coverage
 - errors and accuracy
 - factors affecting reliability and accuracy

19. Secondary surveillance radar
 - principles (transponders)
 - application
 - presentation and interpretation
 - modes and codes

7. OPERATIONAL PROCEDURES

- (a) Pilots of aeroplanes shall be conversant with,
- (i) Use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations and,
 - (ii) Appropriate precautionary and emergency procedures, including action to be taken to avoid hazardous weather, wake turbulence and other operating hazards, relevant to holder of a Private Pilot Licence for Aeroplane.
- (b) Pilots of helicopters shall be conversant with,
- (i) Use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations and,
 - (ii) Appropriate precautionary and emergency procedures, including action to be taken to avoid hazardous weather and wake turbulence; settling with power, ground resonance, roll-over and other operating hazards, relevant to holder of a Private Pilot Licence for Helicopter.

SYLLABUS

1. ICAO Annex 6, Part- Operation of aircraft
 - foreword
 - definitions
 - general statement
 - flight preparation and in-flight procedures
 - performance and operating limitations
 - instruments and equipment
 - communications and navigation equipment
 - maintenance
 - flight crew
 - lights to be displayed
2. ICAO Annex 12 – Search and rescue
 - definitions
 - alerting phases
 - procedures for pilot-in-command (para 5.8 and 5.9)
 - search and rescue signals (para 5.9 and Appendix A)
3. ICAO Annex 13 – Aircraft accident investigation
 - definitions
 - national procedures
4. Noise abatement
 - general procedures
 - application to take-off and landing
5. Contravention of aviation regulations
 - offences
 - penalties

8. PRINCIPLES OF FLIGHT

Pilots shall be conversant with the Principles of flight relating to aeroplanes/helicopters, relevant to the holder of a Private Pilot Licence for Aeroplane/Helicopter.

SYLLABUS

1. The atmosphere
 - composition and structure
 - ICAO standard atmosphere
 - atmospheric pressure

2. Airflow around a body, sub-sonic
 - air resistance and air density
 - boundary layer
 - friction forces
 - laminar and turbulent flow

3. Airflow about a two dimensional aerofoil
 - airflow around a flat plate
 - airflow around a curved plate (aerofoil)
 - description of aerofoil cross section
 - lift and drag
 - C_l and C_d and their relationship to angle of attack

4. Three dimensional flow about an aerofoil
 - aerofoil shapes and wing platforms
 - induced drag
 - downwash angle, vortex drag, ground effect
 - aspect ratio
 - parasite (profile) drag
 - form, skin friction and interference drag
 - lift/drag ration

5. Distribution of the four forces
 - balance and couples
 - lift and mass
 - thrust and drag
 - methods of achieving balance

6. Flying controls
 - the three planes
 - pitching about the lateral axis
 - rolling about the longitudinal axis
 - yawing about the normal axis
 - effects of the elevators (stabilators), ailerons and rudder
 - control in pitch, roll and yaw
 - cross coupling, roll and yaw
 - mass and aerodynamic balance of control surfaces

7. Trimming controls
 - basic trim tab, balance tab and anti-balance tab
 - purpose and function
 - method of operation

8. Flaps and slats
 - simple, split, slotted and Fowler flaps
 - purpose and function
 - operational use
 - slats, leading edge
 - purpose and function
 - normal/automatic operation

9. The stall
 - stalling angle of attack
 - disruption of smooth airflow
 - reduction of lift, increase of drag
 - movement of centre of pressure
 - symptoms of development
 - aeroplane characteristics at the stall
 - factors affecting stall speed and aeroplane behaviour at the stall
 - stalling from level, climbing, descending and turning flight
 - inherent and artificial stall warnings
 - recovery from the stall

10. Avoidance of spins
 - wing tip stall
 - the development of roll
 - recognition at the incipient stage
 - immediate and positive stall recovery

11. Stability
 - definitions of static and dynamic stability
 - longitudinal stability
 - centre of gravity effect on control in pitch
 - lateral and directional stability
 - interrelationship, lateral and directional stability

12. Load factor and manoeuvres
 - structural considerations
 - manoeuvring and gust envelope
 - limiting load factors, with and without flaps
 - changes in load factor in turns and pull-ups
 - manoeuvring speed limitations
 - in-flight precautions

13. Stress loads on the ground
 - side loads on the landing gear
 - landing
 - Taxiing, precautions during turns

9. RADIOTELEPHONY

Pilots shall be conversant with radiotelephony procedures and phraseology, as applied to VFR operations : action to be taken in case of communication failure relevant to the holder of a Private Pilot Licence for Aeroplane/Helicopter.

SYLLABUS

Radiotelephony (Communications)

1. Radio telephony and communications
 - use of AIP and frequency selection
 - microphone technique
 - phonetic alphabet
 - station/aeroplane callsigns/abbreviations
 - transmission technique
 - use of standard words and phrases
 - listening out
 - required 'readback' instructions
2. Departure procedures
 - radio checks
 - taxi instructions
 - holding on ground
 - departure clearance
3. En-route procedures
 - frequency changing
 - position, altitude / flight level reporting
 - flight information service
 - weather information
 - weather reporting
 - procedures to obtain bearings, headings, position
 - procedural phraseology
4. Arrival and traffic pattern procedures
 - arrival clearance
 - callas and ATC instructions during the :
 - circuit
 - approach and landing
 - vacating runway
5. Communications failure
 - Action to be taken
 - alternate frequency
 - serviceability check, including microphone and headphones
 - in-flight procedures according to type of airspace

6. Distress and urgency procedures
- distress (Mayday), definition and when to use
 - frequencies to use
 - contents of Mayday message
 - urgency (Pan), definition and when to use
 - frequencies to use
 - relay of messages
 - maintenance of silence when distress/urgency calls heard
 - cancellation of distress/urgency

General Flight Safety

7. Aeroplane
- seat adjustment and security
 - harnesses and seat belts
 - emergency equipment and its use
 - fire extinguisher
 - engine/cabin fires
 - de-icing systems
 - survival equipment, life jackets, life rafts
 - carbon monoxide poisoning
 - refuelling precautions
 - flammable goods/pressurised containers
8. Operational
- wake turbulence
 - aquaplaning
 - windshear, take-off, approach and landing
 - passenger briefings
 - emergency exits
 - evacuation from the aeroplane
 - forced landings
 - gear-up landing
 - ditching

**PILOTS' TECHNICAL EXAMINATION SYLLABUS FOR
ATPL,CPL & IR
(AEROPLANES/HELICOPTERS)**

PILOTS' TECHNICAL EXAMINATION SYLLABUS FOR ATPL, CPL & IR (AEROPLANES & HELICOPTERS)

INTRODUCTION

As depicted in Rule 24(b)/29(b), 26(b)/30(b) and 32(a)/32A(a) of CAR '84 (Part-1), an applicant, for issue of Commercial/Airlines Transport Pilot Licence for Aeroplane/Helicopter and for issue of Instrument Rating for Aeroplane/Helicopter shall have passed at list Higher Secondary School Certificate (Science) Examination with Physics and Mathematics or its Equivalent and shall have passed a written Examination conducted by Civil Aviation Authority, Bangladesh in the subjects and associated syllabi thereof. The subjects are :

1. AIR LAW
2. AIRCRAFT GENERAL KNOWLEDGE
3. FLIGHT PERFORMANCE & PLANNING
4. HUMAN PERFORMANCE AND LIMITATIONS
5. METEOROLOGY
6. NAVIGATION
7. OPERATIONAL PROCEDURES
8. PRINCIPLES OF FLIGHT
9. RADIOTELEPHONY

This syllabus for each subject shall supersede all syllabi issued before in this context. No alteration shall be allowed in the syllabus without the approval of Chairman, CAAB.

Before imparting lessons to the trainees, all authorized Training Institutions/Organizations/Operators etc, shall prepare 'Lesson Plans' on the syllabus of each subject and shall get the same approved by CAAB.

Examinations are to be conducted out of 50 Marks for each of Operations Procedures & Radiotelephony and out of 100 Marks for each of the remaining subjects.

Examination Papers for each subject shall contain a few **Descriptive** (about 20% of the full marks), **Multiple Choices** (about 60% of the full marks), **True/False** (about 10% of the full marks) and **Fill in the Blanks** (about 10% of the full marks).

1. AIR LAW

- (a). For issue of Commercial Pilot Licence, pilots of aeroplanes/helicopters shall be conversant with the rules and regulations, rules of the air and appropriate air traffic services practices and procedures relevant to the holder of a Commercial Pilot Licence for aeroplane/helicopter.
- (b). For issue of Airline Transport Pilot Licence, pilots of aeroplanes/helicopters shall be conversant with the rules and regulations, rules of the air; appropriate air traffic services practices and procedures relevant to the holder of an Airline Transport Pilot Licence for aeroplane/helicopter.

- (c). For issue of Instrument rating, pilots of aeroplanes/helicopters shall be conversant with the rules and regulations relevant to flight under IFR, related to air traffic services practices and procedures.

SYLLABUS

Note : The syllabus combines the theoretical knowledge syllabuses for aeroplane and helicopter. Column boxes marked with a cross ('x') indicate that knowledge of the relevant topic is required to be taught for the particular licence level. Column boxes marked with a bullet point (•) indicate that the sub-topic is NOT applicable to the particular licence level.

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
AIR LAW	X	X	X	X	X	X
International Agreements and Organisations	X	X	X	X	X	X
The convention of Chicago	X	X	X	X	X	X
Air Navigation	X	X	X	X	X	X
- general principles and application : sovereignty, territory						
- flight over territory of Contracting States : right of non-scheduled flight, scheduled air services, sabotage, landing at customs airports, applicability of air regulations, rules of the air, search of aircraft						
- measures to facilitate air navigation : customs duty, conditions to be fulfilled with respect to aircraft : certificates of airworthiness, licences of personnel, recognition of certificates and licences, cargo restrictions, photographic apparatus : documents to be carried in aircraft						
- international standards and recommended practices : adoption of international standards and procedures, endorsement of certificates and licences, validity of endorsed certificates and licences : departure from international standards and procedures (notification of differences)						
The International Civil Aviation Organisation	X	X	X	X	X	X
- objectives and composition						
Structure and offices	X	X		X	X	
Duties in relation to :	X			X	X	
- annexes to the convention						
- standards and recommended practices						
- procedures for air navigation services						
- regional supplementary procedures						
- regional air navigation						
- manuals and circulars						
Other International agreements	X	X	X	X	X	X
Warsaw Convention	X	X		X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
PIC authority and responsibility regarding safety and security	X	X		X	X	
Operators and pilots liabilities towards persons and goods on the ground, in case of damage and injury caused by the operation of the aircraft.	X	X		X	X	
Commercial practices and associated rules (leasing) - Dry lease - wet lease	X	X		X	X	
Annex 8 – Airworthiness of Air Craft - applicability	X	X		X	X	
Annex 7- Aircraft Nationality and Registration Marks - applicability	X	X		X	X	
Annex 1- Personnel Licensing - applicability	X	X	X	X	X	X
Rules of the Air (Based on Annex 2)	X	X	X	X	X	X
Annex 2. - essential definitions, applicability of the rules of air, general rules (except water operations), visual flight rules, instrument flight rules, signals interception of civil aircraft, table of cruising levels	X	X	X	X	X	X
Procedures for Air Navigation – Aircraft Operations Doc.8168- Ops/611, Volume 1	X	X	X	X	X	X
Foreword - introduction	X		X	X		X
Definitions and abbreviation (see general statements)	X		X	X		X
Departure procedures - general criteria - standard instrument departures - omni-directional departures - published information - simultaneous operations on parallel or near-parallel instrument runways - area navigation (RNAV) departure procedures based on VOR/DME - use of FMS/RNAV equipment to follow conventional departure procedures	X		X	X		X
Approach procedures - general criteria (except tables) - approach procedure design : instrument approach areas. Accuracy of fixes (only intersection fix tolerance factors. Other fix tolerance factors. Accuracy of facility providing track, approach area splays. descent gradient) - arrival and approach segments : general, standard instrument arrival, initial approach segment (only general), intermediate approach segment, final approach segment (except tables), missed approach segment (only general)	X		X	X		X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
<ul style="list-style-type: none"> - visual manoeuvring (circling) in the vicinity of the aerodrome : general, the visual manoeuvring (circling) area (except table), visual manoeuvring (circling) area not considered for obstacle clearance (except table), minimum descent altitude/height, visual flight manoeuvre, missed approach whilst circling - simultaneous ILS operations on parallel or near-parallel runways - area navigation (RNAV) approach procedures based on VOR/DME - use of FMS/RNAV equipment to follow conventional non-precision approach procedures 						
Holding procedures <ul style="list-style-type: none"> - in flight procedures (except table), entry, holding - obstacle clearance (except table) 	X		X	X		X
Altimeter setting procedures (including ICAO Doc. 7030-regional supplementary procedures) <ul style="list-style-type: none"> - basic requirements (except tables), procedures applicable to operators and pilots (except table) 	X	X	X	X	X	X
Secondary surveillance radar transponder operating procedures (including ICAO Doc. 7030 – regional supplementary procedures) <ul style="list-style-type: none"> - operation of transponders - operation of ACAS equipment - phraseology 	X	X	X	X	X	X
Air Traffic Services (Based on Annex 11 and Doc. 4444)	X	X	X	X	X	X
Air Traffic Services – Annex 11 <ul style="list-style-type: none"> - definitions (see general statements) 	X	X	X	X	X	X
General <ul style="list-style-type: none"> - objective of ATS, divisions of ATS, designation of the portions of the airspace and controlled aerodromes where ATS will be provided, classification of airspaces (appendix 4 of annex 11), required navigation performance (RNP), establishment and designation of the units providing ATS, specifications for flight information regions, control areas and control zones, minimum flight altitudes, priority in the event of an aircraft in emergency, in flight contingencies, time in ATS 	X	X	X	X	X	X
Air Traffic control <ul style="list-style-type: none"> - application - provision of air traffic control service, operation of air traffic control service, separation minima, contents of clearances, co-ordination of clearances, control of persons and vehicles at aerodromes 	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Flight Information Service - application - scope of flight information service - operational flight information service broadcasts	X	X	X	X	X	X
Alerting Service - application, notification of rescue co-ordination centres (only INCERFA, ALERFA, DETRESFA), information to aircraft operating in the vicinity of an aircraft in a state of emergency	X	X	X	X	X	X
Principles governing the Identification of RNP types and the identification of ATS routes other than standard departure and arrival routes (Appendix 1)	X	X	X	X	X	X
Rules of the air and air traffic services (ICAO Doc. 4444-RAC/501/11 and ICAO Doc. 7030 – Regional supplementary procedures) - definitions (see general statements) - relationship to other document	X	X	X	X	X	X
General provisions - general air traffic services operating practices : submission of a flight plan, change from IFR to VFR flight, clearances and information, control of air traffic flow, altimeter setting procedures, indication of heavy wake turbulence category and MLS capacity, position reporting, air traffic incident report, procedures in regard to aircraft equipped with airborne collision avoidance systems (ACAS) - Appendix 1	X	X	X	X	X	X
Area Control Service - general provisions for the separation of controlled traffic - vertical separation : vertical separation application, vertical separation minimum, minimum cruising level, assignment of cruising level, vertical separation during ascent or descent - horizontal separation : lateral separation application, lateral separation application, longitudinal separation application (except between supersonic aircraft) - reduction in separation minima - air traffic control clearances : contents, description of air traffic control clearances, clearance to fly maintaining own separations while in visual meteorological conditions, essential traffic information, clearance of a requested change in flight plan - emergency and communication failure : emergency procedures (only general priority, emergency descent, action by pilot-in-command), air-ground communication failure (only concerning the actions by pilot-in-command), interception of civil aircraft	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Approach Control Service - departing aircraft : general procedures for departing aircraft, clearances for departing aircraft to climb maintaining own separation while in visual meteorological conditions, information for departing aircraft - arriving aircraft : general procedures for arriving aircraft, clearance to descend subject to maintaining own separation in visual meteorological conditions, visual approach, instrument approach, holding, approach sequence, expected approach time, information for arriving aircraft	X	X	X	X	X	X
Aerodrome Control Service - functions of aerodrome control towers : general alerting service provided by aerodrome control towers, suspension of VFR operations by aerodrome control towers - traffic and taxi circuits : selection of runway-in-use - information to aircraft by aerodrome control towers : information related to the operation of the aircraft, information on aerodrome conditions - control of aerodrome traffic : order of priority for arriving and departing aircraft, control of departing and arriving aircraft, wake turbulence categorization of aircraft and increased longitudinal separation minima, authorization of special VFR flights	X	X	X	X	X	X
Flight information Service and Alerting Service - flight information service - alerting service	X	X	X	X	X	X
Use of radar in Air Traffic Services - general provisions : limitations in the use of radar, identification procedures (only establishment of radar identity), position information, radar vectoring - use of radar in the air traffic control service	X		X	X	X	X
Aeronautical Information Service (Based on Annex 15)	X	X	X	X	X	X
Annex 15 - Essential definitions - Applicability	X	X	X	X	X	X
Aerodromes (Based on Annex 14, Vol 1& 2)	X	X	X	X	X	X
Annex 14 - definitions	X	X	X	X	X	X
Aerodrome data : - conditions of the movement area and related facilities	X	X	X	X	X	X
Visual aids for navigation - indicators and signalling devices - markings - lights - signs - markers	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Visual aids for denoting obstacles - marking of objects - lighting of objects	X	X	X	X	X	X
Visual aids for denoting restricted use of areas	X	X	X	X	X	X
Emergency and other services - rescue and fire fighting - apron management service - ground servicing of aircraft	X	X	X	X	X	X
Attachment A to Annex 14 - calculation of declared distances - radio altimeter operating areas - approach lighting systems	X	X	X	X	X	X
Facilitation (Based on Annex 9) - definitions	X	X	X	X	X	X
Entry and departure of aircraft - description, purpose and use of aircraft documents : general declaration	X	X	X	X	X	X
Search and Rescue (Based on Annex 12)	X	X	X	X	X	X
Annex 12 - definitions	X	X	X	X	X	X
Organisation - establishment and provision of SAR service - establishment of SAR regions - establishment and designation of SAR services units	X	X	X	X	X	X
Co-operation - co-operation between States - co-operation with other services	X	X	X	X	X	X
Operating procedures - procedures for pilots-in-command at the scene of an accident - procedures for pilots-in-command intercepting a distress transmission - search and rescue signals	X	X	X	X	X	X
Search and rescue signals : - signals with surface craft - ground/air visual signal code - air/ground signals	X	X	X	X	X	X
Security (Based on Annex 17)	X	X		X	X	
Annex 17	X	X		X	X	
General : - aims and objectives	X	X		X	X	
Organisation - co-operation and co-ordination	X	X		X	X	
Aircraft Accident Investigation (Based on Annex 13)	X	X	X	X	X	X
Annex 13 - definitions - applicability	X	X		X	X	
National Law (CAR'84, AIP, AIS etc)	X	X	X	X	X	X

2. AIRCRAFT GENERAL KNOWLEDGE

- (a). For issue of Commercial Pilot Licence, pilots of aeroplanes/helicopters shall be conversant with,
- i. Principles of operation and functioning of aeroplane/helicopter power plants, systems and instruments,
 - ii. Operating limitations of appropriate aeroplanes/helicopter and power plants; relevant operational information from the flight manual or other appropriate document,
 - iii. Use and serviceability checks of equipment and systems of appropriate aeroplanes/helicopters,
 - iv. Maintenance procedures for airframes, systems and power plants of appropriate aeroplanes/helicopters,
relevant to the holder of a Commercial Pilot Licence for Aeroplane/Helicopter.
- (b). For issue of Airline Transport Pilot Licence, pilots of aeroplanes/helicopters shall be conversant with,
- i. General characteristics and limitations of electrical, hydraulic, pressurization and other aeroplane/helicopter systems, flight control systems, including autopilot and stability augmentation,
 - ii. Principles of operation, handling procedures and operating limitations of aeroplane/helicopter powerplants, effects of atmospheric conditions on engine performance, relevant operational information from the flight manual or other appropriate document,
 - iii. Operating procedures and limitations of appropriate aeroplanes/helicopter, effects of atmospheric conditions on aeroplane/helicopter performance,
 - iv. Use and serviceability checks of equipment and systems of appropriate aeroplanes/helicopter,
 - v. Flight instruments, compasses, turning and acceleration errors, gyroscopic instruments, operational limits and precession effects, practices and procedures in the event of malfunctions of various flight instruments,
 - vi. Maintenance procedures for airframes, systems and powerplants of appropriate aeroplanes/helicopter,
relevant to the holder of a Commercial Pilot Licence for Aeroplane/Helicopter.

- (c). For issue of Instrument Rating, pilots of aeroplanes/helicopters shall be conversant with,
- i. The use and serviceability of avionics and instruments necessary for the control and navigation of aeroplanes/helicopters under IFR and in Instrument meteorological conditions, use and limitations of autopilot.
 - ii. Compasses, turning and acceleration errors, gyroscopic instruments, operational limits and precession effects, practices and procedures in the event of malfunctions of various flight instruments.

SYLLABUS

Note: The syllabus combines the theoretical knowledge syllabuses for Aeroplane and Helicopter. Column boxes marked with a cross ('x') indicate that knowledge of the relevant topic is required to be taught for the particular licence level. Column boxes marked with a bullet point (•) indicate that the sub-topic is NOT applicable to the particular licence level.

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
AIRCRAFT GENERAL KNOWLEDGE	X	X	X	X	X	X
AIRFRAME AND SYSTEMS, ELECTICS, POWERPLANT, EMERGENCY EQUIPMENT – AEROPLANES	X	X				
AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT, EMERGENCY EQUIPMENT – HELICOPTERS				X	X	
AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT, EMERGENCY EQUIPMENT – AIRCRAFT			X			X
AIRFRAME AND SYSTEMS – AEROPLANES	X	X	X			X
Fuselage	X	X				
- types of construction						
- structural components and materials						
- stress						
Cockpit and cabin windows	X	X				
- construction (laminated glass)						
- structural limitations						
Wings	X	X				
- types of construction						
- structural components and materials						
- stress relief of engines, etc.		•				
- stress						
Stabilising surfaces	X	X				
- vertical, horizontal and V-tail surfaces						
- construction materials						
- efforts						
- 'flutter'		•				
- compensation system						
- mach trim						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Landing Gear	X	X				
- types						
- construction						
- locking devices and emergency extension systems						
- accidental retraction prevention devices						
- position, movement lights and indicators						
- nose wheel steering						
- wheels and tyres (construction, limitations)						
- braking systems						
- construction						
- parking brake						
- mode of operation of anti-skid system						
- mode of operations of auto brake system						
- operation, indications and warning systems						
Flight Controls (construction and operation)	X	X				
Primary controls :	X	X				
- elevator, aileron and rudder						
- trim						
- mode of actuation (mechanical, hydraulic, electrical, fly-by-wire)						
- operation, indicators, warning devices and controls						
- efforts to transmit						
Secondary controls :	X	X				
- leading and trailing edge lift augmentation devices						
- lift dumping and speed brakes						
- variable elevator						
- mode of actuation (mechanical, hydraulic, electrical, fly by-wire)						
- operation, indicators, warning devices						
- danger situations and potential failures						
Hydraulics	X	X				
Basic principles of hydromechanics	X	X				
- hydraulic fluids						
- schematic construction and functioning of hydraulic systems						
Hydraulic systems	X	X				
- main, standby and emergency systems						
- operation, indicators, warning systems						
- ancillary systems						
Air driven systems (piston engines only)	X	X	X			X
Pneumatic systems	X	X				
- power sources						
- schematic construction and functioning of pneumatic systems						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Air conditioning system	X	X				
- heating and cooling						
- construction, functioning and controls						
Pressurisation	X	X				
- cabin altitude, maximum cabin altitude, differential pressure						
- pressurized zones in the aircraft						
- operation and indicators						
- safety devices and warning systems						
- rapid decompression, cabin altitude warning						
- emergency procedures						
De-ice systems	X	X	X			X
- pneumatic leading edge de-icing of wings and control surfaces						
- schematic construction						
- operational limitations						
- initiation/timing of de-icing system usage						
Air Driven Systems (Turbo propeller and Jet aircraft)	X	X	X			X
Pneumatic system	X	X				
- power sources						
- schematic construction						
- potential failures, warning devices						
- operation, indicators, warning systems						
- pneumatic operated systems						
Air conditioning system	X	X				
- construction, functioning, operation, indicators and warning devices						
- heating and cooling						
- temperature regulation						
- automatic and manual						
- ram air ventilation						
- schematic construction						
Anti-ice systems	X	X	X			X
- aerofoil (Aeroplane), aerofoil/rotors (Helicopter) and control surfaces, powerplant, air intakes, windshield						
- schematic construction, operating limitations and initiation, timing of de-icing system usage						
- ice warning system						
Pressurisation	X	X				
- cabin altitude, maximum cabin altitude, differential pressure						
- pressurized zones in the aircraft						
- operation and indicators						
- safety devices and warning systems						
- rapid decompression, cabin altitude warning						
- emergency procedures						
Non- pneumatic operated de-ice and anti-ice systems	X	X	X			X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Schematic construction, functioning and operation of : ‘ - air intake - propeller (Aeroplane); propeller/rotors (Helicopter) - pilot, static pressure sensor and stall warning devices - windshield - weeping wing system - rain repellent system	X	X	X			X
Fuel system	X	X				
Fuel tanks - structural components and types - location of tanks on single-and multi-engine aircraft - sequence and types of refuelling - unusable fuel	X	X				
Fuel feed - gravity and pressure feed - cross feed - schematic construction	X	X				
Fuel dumping system	X	X				
Fuel system monitoring - operation, indicators, warning systems - fuel management (sequencing fuel tank switching) - dip stick	X	X				
ELECTRICS	X	X	X	X	X	X
Direct Current (DC) (ATPL and CPL) ; Direct/Alternating Current (DC/AC) (IR)	X	X	X	X	X	X
General - electric circuits - voltage, current, resistance - Ohm's law - Resistive circuits - Resistance as a function of temperature - Electrical power, electrical work - Fuses (function, type and operation) - the electrical field - the capacitor (function)	X	X	X	X	X	X
Batteries - types, characteristics - capacity - uses - hazards	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Magnetism	X	X	X	X	X	X
- permanent magnetism						
- electromagnetism						
- relay, circuit breaker, solenoid valve (principle, function and applications)						
- electromagnetic power						
- electromagnetic induction						
Generators	X	X	X	X	X	X
- alternator :						
- principle, function and applications						
- monitoring devices						
- regulation, control and protection						
- modes of excitation						
- starter generator						
Distribution	X	X	X	X	X	X
- current distribution (buses)						
- monitoring of electrical flight instruments/systems :						
- ammeter, voltmeter						
- annunciators						
- electrical consumers						
- DC power distribution :						
- construction, operation and system monitoring						
- elementary switching circuits						
Inverter (applications)	X	X	X	X	X	X
The aircraft structure as an electrical conductor	X	X		X	X	
Alternating Current (AC)	X	X		X	X	
General	X	X		X	X	
- single and multi-phases AC						
- frequency						
- phase shift						
- AC components						
Generators	X	X		X	X	
- 3-phase generator						
- brushless generator (construction and operation)						
- generator drive :						
- constant speed drive						
- integrated drive						
AC power distribution	X	X		X	X	
- construction, operation and monitoring						
- protection circuits, paralleling of AC-generators						
Transformers	X	X		X	X	
- function						
- types and applications						
Synchronous and asynchronous motors	X	X		X	X	
- operation						
- application						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Transformer/rectifier units	X	X		X	X	
Semiconductor	X	X		X	X	
- principles of semiconductors						
- semiconductor resistors (properties and application)						
- rectifier (function and applications)						
- transistor (function and applications)						
- diode (function and applications)						
Basic knowledge of computers	X	X		X	X	
Logic circuits	X	X		X	X	
Logical symbols	X	X		X	X	
Switching circuits and logical symbols	X	X		X	X	
Basic radio propagation theory	X	X	X	X	X	X
Basic principles	X	X	X	X	X	X
- electromagnetic waves						
- wave length, amplitude, phase angle, frequency						
- frequency bands, sideband, single sideband						
- pulse characteristics						
- carrier, modulation, demodulation						
- kinds of modulation (amplitude, frequency, pulse, multiples)						
- oscillation circuits						
Antennas	X	X	X	X	X	X
- characteristics						
- polarization						
- types of antennas						
Wave propagation	X	X	X	X	X	X
- ground waves						
- space waves						
- propagation with the frequency bands						
- frequency prognosis (MUF)						
- fading						
- factors affecting propagation (reflection, absorption, interference, twilight, shoreline, shoreline, mountain, static)						
POWERPLANT	X	X		X	X	
Piston engine	X	X		X	X	
General	X	X		X	X	
- design types						
- principles of the 4-stroke internal combustion engine						
- mechanical components						
Lubrication system	X	X		X	X	
- function						
- schematic construction						
- monitoring instruments and indicators						
- lubricants						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Air cooling - system monitoring - cylinder head temperature - cowl flaps	X	X		X	X	
Ignition - schematic construction and function - types of ignition - magneto check	X	X		X	X	
Engine fuel supply - carburettor (construction and mode of operation, carburettor icing) - fuel injection (construction and mode of operation) - alternate air	X	X		X	X	
Engine performance - pressure/density altitude - performance as a function of pressure and temperature	X	X		X	X	
Power augmentation devices - turbocharger, supercharger (construction and effect on engine performance)	X	X		X	X	
Fuel - types, grades - detonation characteristics, octane rating - colour coding	X	X		X	X	
- additives - water content, ice formation - fuel density - alternate fuels, differences in specification, limitations						
Mixture - rich and lean mixture - maximum power and fuel economy mixture setting	X	X		X	X	
Propeller - fixed pitch and constant speed propeller - principles and operation and operation of propellers on single and multiengine aircraft - propeller check - propeller efficiency as a function of airspeed - aircraft and engine protection (propeller operation ground/air, coarse/fine pitch limitations)	X	X				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Engine handling and manipulation	X	X		X	X	
- power setting, power range						
- mixture setting						
- operational limitations						
Operational criteria	X	X		X	X	
- maximum and minimum RPM						
- (induced) engine vibration and critical RPM						
- remedial action by abnormal engine start, run-up and in-flight						
Turbine engine	X	X		X	X	
Principles of operation	X	X		X	X	
Types of construction	X	X		X	X	
- centrifugal						
- axial flow						
- free turbine						
- single shaft turbine	•	•		•	•	
- turboprop	•	•		•	•	
- turbojet				•	•	
- turbofan						
Engine construction	X	X		X	X	
Air inlet	X	X		X	X	
- function						
Compressor	X	X		X	X	
- function						
- construction and mode of operation						
- effects of damage						
- compressor stall and surge (cause and avoidance)						
- compressor characteristics						
Diffusor	X	X		X	X	
- function						
Combustion chamber	X	X		X	X	
- function, types and working principles						
- mixing ratios						
- fuel injectors						
- thermal load						
Turbine	X	X		X	X	
- function, construction and working principles						
- thermal and mechanical stress						
- effects of damage						
- monitoring of exhaust gas temperature						
Jet pipe	X	X				
- function						
- different types						
- noise silencing devices						
Pressure, temperature and airflow in a turbine engine	X	X		X	X	
Reverse thrust	X	X				
- function, types and principles of operation						
- degree of efficiency						
- use and monitoring						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Performance and thrust augmentation	X	X				
- water injection, principles of operation						
- use and system monitoring						
Bleed air	X	X		X	X	
- effect of use of bleed air on thrust, exhaust temperature, RPM and pressure ratio				•	•	
- effect of use of bleed air on performance						
Auxiliary gearbox	X	X		X	X	
- function						
Engine systems	X	X		X	X	
Ignition	X	X		X	X	
- function, types, components, operation, safety aspects						
Starter	X	X		X	X	
- function, type, construction and mode of operation						
- control and monitoring						
- self sustaining and idle speeds						
Engine start malfunctions	X	X		X	X	
- cause and avoidance						
Fuel system	X	X		X	X	
- construction, components						
- operation and monitoring						
- malfunctions						
Lubrication	X	X		X	X	
- construction, components						
- operation and monitoring						
- malfunctions						
Fuel	X	X		X	X	
- effects of temperature						
- impurities						
- additives						
Thrust	X	X				
- thrust formula						
- flat rated engine						
- thrust as a function of airspeed, air density, pressures, temperature and RPM						
Powerplant operation and monitoring	X	X		X	X	
Power				X	X	
- power sharing engines						
- function of density						
- flat rated engine						
Auxiliary Power Unit (APU)	X	X		X	X	
General	X	X		X	X	
- function, types						
- location						
- operation and monitoring						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Ram air turbine	X	X				
- function						
EMERGENCY EQUIPMENT	X	X		X	X	
Doors and emergency exits	X	X		X	X	
- accessibility						
- normal and emergency operation						
- markings						
- floor exit markings						
- crew emergency exits						
- passenger emergency exits						
- evacuation slides, general usage or as life rafts or flotation devices				•	•	
Smoke detection	X	X		X	X	
- location, indicators, function test						
Fire fighting equipment	X	X		X	X	
- location, warning mode, function test						
Fire fighting equipment	X	X		X	X	
- location, operation, contents, gauge, function						
Aircraft oxygen equipment	X	X		X	X	
- principles of operation						
- protection and surveillance devices						
- drill, use of equipment in case of rapid decompression				•	•	
- comparison of constant flow and demand outlet masks				•	•	
- oxygen generators						
- dangers of oxygen use, safety measures						
Emergency equipment	X	X		X	X	
- portable, hand-held fire extinguisher						
- smoke mask, smoke protection hood						
- portable oxygen system						
- emergency locator beacon, transmitter						
- life jacket, life raft						
- pocket lamp, emergency lighting						
- megaphone						
- crash axe						
- fireproof gloves						
- emergency flotation system	•	•				
AIRFRAME AND SYSTEMS – HELICOPTERS				X	X	
Helicopter configurations				X	X	
- single rotor						
- tandem rotor						
- coaxial rotor						
- side by side rotor						
Controls and rotors				X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Control systems - types - components - adjustments - primary controls (cyclic, collective, directional)				X	X	
Rotor heads - types - components - material				X	X	
Tail rotors/Notar - types - components - material				X	X	
Blades - types - section - construction - material - adjustment				X	X	
Control surfaces - vertical horizontal - construction - material				X	X	
Fuselage - types of construction - structural components, materials, limitations				X	X	
Cockpit and cabin - construction - structural limitations				X	X	
Landing gear - types e.g floats, skids, wheels, etc ... - construction - locking devices and emergency extension systems - accidental retraction prevention devices - position, movement lights and indicators - wheels and tyres - braking systems : - construction - parking brake - operation, indications and warning systems				X	X	
Transmission systems				X	X	
Drive shafts - types - components - material				X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Gearboxes				X	X	
- types						
- construction						
- material						
- lubrication						
- indications						
Clutches				X	X	
- types						
- components						
Freewheeling				X	X	
- types						
- components						
Rotorbrake				X	X	
- components						
- construction						
Inspection				X	X	
- vibration						
- balancing						
- tracking						
Hydraulics				X	X	
Basic principles of hydromechanics				X	X	
- hydraulic fluids						
- schematic construction and functioning of hydraulic systems						
Hydraulic systems				X	X	
- main, standby and emergency systems						
- operation, indicators, warning systems						
- ancillary systems						
- auxiliary systems						
Air driven systems				X	X	
Pneumatic systems				X	X	
- power sources						
- schematic construction						
- potential failures, safety devices						
- operation, indicators, warning systems						
- pneumatic operated systems						
Air conditioning system				X	X	
- construction, functioning, operation, indicators, and warning devices						
- heating and cooling						
- temperature regulation – automatic and manual						
- ram air ventilation						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
De ice and anti-ice systems				X	X	
- schematic construction, functioning and operation of						
- air intake						
- rotors (main tailrotor)						
- pilot, static pressures sensor						
- windshield						
- control surfaces (horizontal stabiliser)						
- rain repellent system						
- ice warning systems						
Fuel system				X	X	
Fuel tanks (main and auxiliary)				X	X	
- structural components and types						
- location of tanks on single and multi-engine helicopter						
- sequence and types of refuelling						
- unusable fuel						
- crashworthiness						
Fuel feed				X	X	
- gravity and pressure feed						
- crossfeed						
- schematic construction						
Fuel dumping system				X	X	
Fuel system monitoring				X	X	
- operation, indicators, warning systems						
- fuel management (sequencing of fuel tank switching)						
- dip stick						
FLIGHT INSTRUMENTS	X	X	X	X	X	X
Air data instruments	X	X	X	X	X	X
Pilot and static system	X	X	X	X	X	X
- Pilot tube, construction and principles of operation						
- static source						
- malfunction						
- heating						
- alternate static source						
Altimeter	X	X	X	X	X	X
- construction and principles of operation						
- display and setting						
- errors						
- correction tables						
- tolerances						
Airspeed indicator	X	X	X	X	X	X
- construction and principles of operation						
- speed indications (IAS)						
- meaning of coloured sectors						
- maximum speed indicator, Vmo/Mmo pointer						
- errors						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Mach meter - mach number formula - construction and principles of operation - display - construction types - errors	X					
Vertical Speed Indicator (VSI) - aneroid and instantaneous VSI (IVSI) - construction and principles of operation - display	X	X	X	X	X	X
Air Data Computer (ADC) - principles of operation - input and output data, signals - uses of output data - block diagram - system monitoring	X			X	X	
Gyroscopic instruments	X	X	X	X	X	X
Gyro fundamentals - theory of gyroscopic forces (stability, precession) - types, construction and principles of operation - vertical gyro - directional gyro - rate gyro - rate integrating gyro - single degree-of-freedom gyro - ring laser gyro - apparent drift - random drift - mountings - drive types, monitoring	X	X	X	X	X	X
Directional gyro - construction and principles of operation	X	X	X	X	X	X
Slaved gyro compass - construction and principles of operation - components - mounting and modes of operation - turn and acceleration errors - application, uses of output data	X	X	X	X	X	X
Attitude indicator (vertical gyro) - construction and principles of operation - display types - turn and acceleration errors - application, uses of output data	X	X	X	X	X	X
Turn and bank indicator (rate gyro) - construction and principles of operation - display types - application errors - application, uses of output data - turn co-ordinator	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Gyro stabilized platform (gimballed platform) - types in use - accelerometer, measurement systems - construction and principles of operation - platform alignment - applications, uses of output data	X			X	X	
Fixed installations (strap down systems) - construction and principles of operation - types in use - input signals - application, uses of output data	X			X	X	
Magnetic compass - construction and principles of operation - errors (deviation, effect of inclination)	X	X	X	X	X	X
Radio Altimeter - components - frequency band - principle of operation - display - errors	X	X	X	X	X	X
Electronic Flight Instrument System (EFIS) - information display types - data input - control panel, display unit - example of a typical aircraft installation	X	X	X	X	X	X
Flight Management System (FMS) - general principles - inputs and outputs of data	X			X	X	
AUTOMATIC FLIGHT CONTROL SYSTEMS	X	X	X	X	X	X
Flight Director - function and application - block diagram, components - mode of operation - operation set-up for various flight phases - command modes (bars) - mode indicator - system monitoring - limitations, operational restrictions	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Autopilot	X	X	X	X	X	X
- function and application						
- types (different axes)						
- block diagram, components						
- lateral modes						
- longitudinal modes						
- common modes						
- autoland, sequence of operation			●	●	●	●
- system concepts for autoland, go around, take-off, fail passive, fail operational (redundant)			●	●	●	●
- control modes						
- signal interfacing to control surfaces						
- operation and programming for various flight phases						
- system monitoring						
- limitations, operational restrictions						
Flight envelope protection	X			X	X	
- function						
- input data, signals						
- output data, signals						
- system monitoring						
Yaw Damper/Stability augmentation system	X	X	X	X	X	X
- function						
- block diagram, components						
- signal interfacing to vertical stabilizer			●			
Automatic pitch trim	X					
- function						
- input data, signals						
- mode of operation						
- horizontal stabilizer, trim tab actuator						
- system monitoring, safety of operation						
Thrust computation	X					
- function						
- components						
- input data, signals						
- output data, signals						
- system monitoring						
Auto-thrust	X					
- function and applications						
- block diagrams, components						
- mode of operation						
- automatic operation mode selection						
- signal interfacing to throttle level mechanism						
- operation and programming for various flight phases						
- system monitoring						
- limitations, operational restrictions						
WARNING AND RECORDING EQUIPMENT	X	X		X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Warnings general - classification of warning - display, indicator systems	X	X		X	X	
Altitude alert system - function - block diagram, components - operation and system monitoring	X			X	X	
Ground proximity warning system (GPWS) - function - block diagram, components - input data, signals - warning modes - system integrity test	X			X	X	
Traffic collision avoidance system (TCAS) - function - warning modes	X			X	X	
Overspeed warning - function - input data, signals - display, indicators - function test - effects on operation in case of failure	X					
Stall warning - function - constituent components of a simplified system - block diagram, components of a system with angle-of-attack indicator - operation	X	X				
Flight data recorder - function - block diagram, components - operation - system monitoring	X			X	X	
Cockpit voice recorder - function - block diagram, components - operation	X			X	X	
Rotors and engine over/under speed warning - function - input data, signals - display, indicators - function test - effects on operation in case of failure				X	X	
POWERPLANT AND SYSTEM MONITORING INSTRUMENTS	X	X		X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Pressure gauge - sensors - pressure indicators - meaning of coloured sectors	X	X		X	X	
Temperature gauge - sensors - ram rise, recovery factor - temperature indicators - meaning of coloured sectors	X	X		X	X	
RPM indicator - interfacing of signal pick-up to RPM gauge - RPM indicators, piston and turbine engines - meaning of coloured sectors	X	X		X	X	
Consumption gauge - fuel flow meter (function, indicators) - high pressure line fuel flow meter (function, indications, failure warnings)	X	X		X	X	
Fuel gauge - measurement of volume/mass, units - measuring sensors - content, quantity indicators - reasons for incorrect indications	X	X		X	X	
Torque meter - indicators, units - meaning of coloured sectors	X	X		X	X	
Flight hour meter - drive source - indicators	X	X		X	X	
Vibration monitoring - indicators, units - interfacing to bypass turbofan engines - warning system	X	X				
Remote (signal) transmission system - mechanical - electrical	X	X		X	X	
Electronic Displays - EFIS - EICAS - ECAM	X	X		X	X	
Chip detection - indicators - principles				X	X	

3. FLIGHT PERFORMANCE AND PLANNING

- (a) For issue of Commercial Pilot Licence, pilots of aeroplanes/helicopters shall be conversant with,
- i. The effects of loading and mass distribution on aeroplane/helicopter handling, flight characteristics and performance, mass and balance calculations, and
 - ii. The use and practical application of take-off, landing and other performance data
 - iii. Pre-flight and en-route flight planning appropriate to operations under VFR, preparation and filing of air traffic services flight plans, appropriate air traffic services procedures and altimeter setting procedures, relevant to the holder of a Commercial Pilot Licence for aeroplane/helicopter.
- (b). For issue of Airline Transport Pilot Licence, pilots of aeroplanes/helicopters shall be conversant with,
- i. Effects of loading and mass distribution on aeroplane handling, flight characteristics and performance, mass and balance calculations,
 - ii. Use and practical application of take-off, landing and other performance data, including procedures for cruise control and,
 - iii. Pre-flight and en-route operational flight planning, preparation and filing of air traffic services flight plans, appropriate air traffic services procedures, altimeter setting procedures, relevant to the holder of an Airline Transport Pilot Licence for aeroplane/helicopter.
- (c). For issue of Instrument rating, pilots of aeroplanes/helicopters shall be conversant with
- i. Pre-flight preparations and checks appropriate to flight under IFR and
 - ii. Operational flight planning, preparation and filing of air traffic services flight plans under IFR, altimeter setting procedures.

SYLLABUS

Note : The syllabus combines the theoretical knowledge syllabuses for Aeroplane and Helicopter. Column boxes marked with a cross ('x') indicate that knowledge of the relevant topic is required to be taught for the particular licence level. Column boxes marked with a bullet point (•) indicate that the sub-topic is NOT applicable to the particular licence level.

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
FLIGHT PRERFORMANCE AND PLANNING	X	X	X	X	X	X
MASS AND BALANCE – AEROPLANES	X	X				
MASS AND BALANCE – HELICOPTERS				X	X	
INTRODUCTION TO MASS AND BALANCE	X	X		X	X	
Centre of gravity (cg)	X	X		X	X	
Definition	X	X		X	X	
Importance in regard to aircraft stability (Aeroplane) : Importance in regard to helicopter stability (cyclic stick travel/limitations) (Helicopter)	X	X		X	X	
Mass and balance limits	X	X		X	X	
Consult aeroplane/helicopter flight manual for : - cg limits for take-off, landing, cruise configurations	X	X		X	X	
Maximum floor load	X	X		X	X	
Maximum ramp and taxi mass (Aeroplane) : Maximum taxi mass (Helicopter)	X	X		X	X	
Factors determining maximum permissible mass : - structural limitations - performance limitations such as : runway available for take-off and landing - weather conditions (temperature, pressure, wind, precipitation) rate-of-climb and altitude requirements for obstacle clearance ; engine-out performance requirements	X	X		X	X	
Factors determining cg limits : - aircraft stability, helicopter stability ; ability of flight controls and surfaces to overcome mass and lift pitching moments under all flight conditions - changes in cg location during flight due to consumption of fuel, raising and lowering of undercarriage, and intentional relocation of passengers or cargo, transfer of fuel - movement of centre of lift because of changes in position of wing flaps (Aeroplane) ; Influence of hoist and external load operation (Helicopter)	X	X		X	X	
LOADING	X	X		X	X	
Terminology	X	X		X	X	
Empty mass	X	X		X	X	
Dry Operating Mass (empty mass + crew + operating items + unusable fuel)	X	X		X	X	
Zero Fuel Mass	X	X		X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Standard mass	X	X		X	X	
- crew, passengers and baggage						
- fuel, oil, water (volume/mass conversion factors)						
- carry-on luggage						
Useful load (traffic load + usable fuel)	X	X		X	X	
Aircraft mass checks	X	X		X	X	
Procedure (in general terms, details not necessary)	X	X		X	X	
Requirements for re-weighing of aircraft	X	X		X	X	
Equipment lists	X	X		X	X	
Procedures for determining aeroplane mass and balance documentation, Procedures for determining helicopter mass and balance documentation	X	X		X	X	
Determine Dry Operating Mass (crew, equipment, etc.)	X	X		X	X	
Intentionally left blank	X	X		X	X	
Add mass of passengers and cargo (including passengers baggage) (standard mass)	X	X		X	X	
Add mass of fuel	X	X		X	X	
Check that applicable maximum gross mass limits are not exceeded (mass within legal limits)	X	X		X	X	
Effects of overloading	X	X		X	X	
Higher take-off and safety speeds	X	X		X	X	
Longer take-off and landing distances	X	X		X	X	
Lower rate-of-climb	X	X		X	X	
Influence on range and endurance (Aeroplane) Decreased range and endurance (Helicopter)	X	X		X	X	
Decreased engine-out performance	X	X		X	X	
Possible structural damage in extreme cases	X	X		X	X	
CENTRE OF GRAVITY (cg)	X	X		X	X	
Basis of cg calculations (load and balance documentation)	X	X		X	X	
Datum	X	X		X	X	
- explanation of term						
- location						
- use in cg calculation						
Moment arm	X	X		X	X	
- explanation of term						
- determination of algebraic signs						
- use						
Moment	X	X		X	X	
- explanation						
- moment = mass x moment arm						
Expression in percentage of mean aerodynamic chord (% MAC)	X	X				
Expression of distance from Datum line				X	X	
Calculation of cg (Aeroplane) Calculation of cg longitudinal and lateral (including computer calculations) (Helicopter)	X	X		X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Cg at empty mass	X	X		X	X	
- determined when aircraft is weighed ; determined when helicopter is weighed						
- recorded in aircraft documentation cg at Dry Operating Mass (Aeroplane) ; recorded in helicopter documentation cg at Dry Operating Mass						
Movement of cg with addition of fuel, load and ballast	X	X		X	X	
Practical methods of calculation	X	X		X	X	
- computation method using either mathematical computations or specially designed slide rule						
- graph method						
- table method						
Intentional relocation of passengers or cargo to remain within cg limits				X	X	
Securing of load	X	X		X	X	
Importance of adequate tie-down	X	X		X	X	
- equipments for cargo compartment and cargo aircraft						
- container				•	•	
- pallet						
Effect of load shift	X	X		X	X	
- movement of cg, possible out of limits						
- possible damage due to inertia of a moving load effect of acceleration of the aircraft load						
Area Load, Running Load, Supporting	X	X		X	X	
PERFORMANCE – AEROPLANES	X	X				
PERFORMANCE OF SINGLE-ENGINE AEROPLANES	X	X				
Definitions of terms and speeds used	X	X				
Take-off and landing performance	X	X				
Effect of aeroplane mass, wind, density, altitude, runway slope, runway conditions	X	X				
Use of aeroplane flight manual data	X	X				
Climb and cruise performance	X	X				
Use of aeroplane flight data	X	X				
Effect of density altitude and aeroplane mass	X	X				
Endurance and the effects of the different recommended power settings	X	X				
Still air range with various power settings	X	X				
PERFORMANCE OF MULTIENGINE AEROPLANES	X	X				
Definitions of terms and speeds	X	X				
Any new terms used for multi-engine aeroplane performance	X	X				
Importance of performance calculations	X	X				
Determination of performance under normal conditions	X	X				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Consideration of effects of pressure altitude, temperature, wind, aeroplane mass, runway slope, and runway conditions	X	X				
Elements of performance	X	X				
Take-off and landing distances - obstacle clearance at Take-off	X	X				
Rate of climb and descent - effects of selected power settings, speeds, and aircraft configuration	X	X				
Cruise altitudes and altitude ceiling - en-route requirements	X	X				
Payload/range trade-offs	X	X				
Speed/economy trade-offs	X	X				
Use of performance graphs and tabulated data	X	X				
Performance section of flight manual	X	X				
PERFORMANCE OF AEROPLANES	X					
Take-off	X					
Definitions of terms and speeds used - appropriate speed definitions associated with take-off performance, with emphasis on : - V_1 : decision speed in event of engine failure on take-off - V_R : rotation speed	X					
- V_2 : take-off safety speed - appropriate distance definitions associated with take-off : - balanced field length - take-off run available (TORA) - take-off distance available (TODA) - accelerate stop distance available (ASDA) - clearways, stopways - mss/altitude/temperature limits - other appropriate speeds : - V_{MCG} - V_{MCA} - V_{MU} - V_{LOF} - V_{MBE}						
Runway variables	X					
- length, slope, surface - strength of runway (load classification number, single isolated wheel loading)	X					

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Aeroplane variables <ul style="list-style-type: none"> - mass - flap angle - reduced power settings - increased V_2 - use of anti-ice and de-ice - use of bleed air (ECS) 	X					
Meteorological variables <ul style="list-style-type: none"> - pressure altitude and temperature (density altitude), wind gust factor, surface conditions (standing water, snow, ice etc.) 	X					
Take-off speeds <ul style="list-style-type: none"> - computation of V_1, V_R and V_2 : initial climb speed, landing gear and flap retraction speeds 	X					
Take-off distance <ul style="list-style-type: none"> - computations of take-off distance - include consideration of aeroplane, runway, and meteorological variables when computing take-off distance and take off speed - effects of early or late rotation on take-off distance: possibility of ground stall with early rotation 	X					
Accelerate-stop distance	X					
Concept of balanced field length <ul style="list-style-type: none"> - review of definitions - relationship between balanced/unbalanced field length and V_1 	X					
Use of flight manual charts <ul style="list-style-type: none"> - computing accelerate-stop distances - decision time and deceleration procedure assumptions : - time to-decide allowance - use of brakes - use of reverse thrust 	X					
<ul style="list-style-type: none"> - brake energy absorption limits : - delayed temperature rise - tyre limitations 						
Initial climb	X					
Climb segments <ul style="list-style-type: none"> - undercarriage and flap retraction - take-off mass limitation with regard to climb requirements 	X					

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
All engines operating <ul style="list-style-type: none"> - climb speed - rate of climb - noise abatement procedure 	X					
Engine inoperative operation <ul style="list-style-type: none"> - best angle-of-climb speed - best rate-of-climb speed - rates of climb : - effect of density altitude on climb performance 	X					
Obstacle clearance requirements <ul style="list-style-type: none"> - climb to clear obstacles - turning to avoid obstacles : - effect turns have on climb performance 	X					
Climb	X					
Use of flight manual performance charts <ul style="list-style-type: none"> - effect of aeroplane mass - effect of density altitude change - time-to-climb calculations for reaching cruise altitude 	X					
Significant airspeeds for climb <ul style="list-style-type: none"> - flap retraction speeds - normal (all engines operating) climb speed : - best angle-of-climb - best rate-of-climb 	X					
One engine inoperative climb <ul style="list-style-type: none"> - climb airspeeds : - best rate-of-climb - best angle-of-climb - maximum cruise height 	X					
Cruise	X					
Use of cruise charts <ul style="list-style-type: none"> - determination of cruise heights - maximum attainable cruise height - increase of maximum cruise speeds and power settings 	X					
Cruise control <ul style="list-style-type: none"> - maximum range : power settings, speeds, fuel consumption - maximum endurance : power settings, speeds, fuel consumption - speed/range trade-offs, for cruise power settings - maximum cruise power settings : resultant speeds, fuel consumption 	X					
En-route One Engine Inoperative <ul style="list-style-type: none"> - engine inoperative charts - range and endurance - One-engine Out Service Ceiling : - maximum continuous power settings - ETOPS operations 	X					

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Obstacle clearance en-route <ul style="list-style-type: none"> - net flight path - vertical and horizontal - overhead mass limitations - drift-down procedures 	X					
En-route –Aeroplanes with Three or More Engines, two engines inoperative <ul style="list-style-type: none"> - requirements and limitations 	X					
Descent and landing	X					
Use of descent charts <ul style="list-style-type: none"> - time to start descent - fuel consumption in descent - limiting speed, e.g. <ul style="list-style-type: none"> - normal operating airspeed - maximum operating airspeed - speed for max glide ratio - maximum rate of descent speed (cabin pressure rate of descent) 	X					
Maximum permitted landing mass <ul style="list-style-type: none"> - structural limit specified by aircraft manufacturer and the State airworthiness authorities 	X					
Approach and Landing data calculations <ul style="list-style-type: none"> - suitability of selected landing runway : <ul style="list-style-type: none"> - landing distance available - computation of maximum landing mass for the given runway conditions - computation of minimum runway length for the given <ul style="list-style-type: none"> - other factors : runway slope, surface conditions - wind temperature, density altitude - computation of expected actual landing mass - computations of approach and landing speeds - computations should be completed for alternate aerodromes as well - definitions of terms and speed used : <ul style="list-style-type: none"> - VTH, Threshold speed - Discontinued Approach Climb - Landing climb - Landing distance, Dry, Wet and Contaminated runways - Landing Distance required <ul style="list-style-type: none"> - Destination airport - Alternate airport - Landing <ul style="list-style-type: none"> - Landing configuration (all engine) - Approach configuration (one engine out) 	X					
Practical application of an airplane performance manual	X					

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Use of typical turbojet or turboprop aeroplane performance manual <ul style="list-style-type: none"> - take-off and landing mass calculations - take-off data computations : <ul style="list-style-type: none"> - effects of runway variables, aeroplane variables and meteorological variables - computation of the various 'V' speeds for take-off and initial climb - computation of runway distance factors - rate and gradient of initial climb - obstacle clearance - appropriate engine-out calculations - climb computations : - climb rates and gradients - time-to-climb - fuel used - engine-out calculations 	X					
Cruise computations <ul style="list-style-type: none"> - power settings and speeds for maximum range maximum endurance and normal cruise - fuel consumption - engine-out operation : pressurisation failure, effect of lower altitude on range and endurance - ETOPS flight - additional considerations concerning fuel consumption : <ul style="list-style-type: none"> - effects of altitude and aircraft mass - fuel for holding, approach and cruise to alternate - in normal and abnormal conditions - after jet engine failure - after decompression 	X					
FLIGHT PLANNING - AEROPLANES	X	X				
FLIGHT PLANNING - HELICOPTERS				X	X	
FLIGHT PLANNING - AIRCRAFT			X			X
FLIGHT PLANS FOR CROSS-COUNTRY FLIGHTS	X	X	X	X	X	X
Navigation plan	X	X	X	X	X	X
Selection of routes, speeds, heights (altitudes) and alternate airfield/landing sites <ul style="list-style-type: none"> - terrain and obstacle clearance - cruising levels appropriate for direction of flight - navigation check points, visual or radio 	X	X	X	X	X	X
Measurement of tracks and distances	X	X	X	X	X	X
Obtaining wind velocity forecast for each leg	X	X	X	X	X	X
Computations of headings, ground speeds, and time en-route from tracks, true airspeed and wind velocities	X	X	X	X	X	X
Completion of pre-flight portion of navigation flight log	X	X	X	X	X	X
Fuel plan	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Computation of planned fuel usage for each leg and total fuel usage for the flight - flight manual figures for fuel flow during climb, en-route and during descent - navigation plan for times en-route	X	X	X	X	X	X
Fuel for holding and diversion to alternate airfield	X	X	X	X	X	X
Reserves	X	X	X	X	X	X
Total fuel requirements for flight	X	X	X	X	X	X
Completion of pre-flight portion of fuel log	X	X	X	X	X	X
Flight monitoring and in-flight re-planning	X	X	X	X	X	X
In-flight fuel computations - recording of fuel quantities remaining at navigational checkpoints	X	X	X	X	X	X
Calculation of actual consumption rate - comparison of actual and planned fuel consumption and fuel state	X	X	X	X	X	X
Revision of fuel reserve estimates	X	X	X	X	X	X
In-flight re-planning in case of problems - selection of cruise altitude and power settings for new destination - time to new destination - fuel state, fuel requirements, fuel reserves	X	X	X	X	X	X
Radio communication and navigation aids	X	X	X	X	X	X
Communication frequencies and call signs for appropriate control agencies and in-flight service facilities such as weather stations	X	X	X	X	X	X
Radio navigation and approach aids, if appropriate - type - frequencies - identification	X	X	X	X	X	X
ICAO ATC FLIGHT PLAN	X	X	X	X	X	X
Types of flight plan	X	X	X	X	X	X
ICAO flight plan - format - information included in completed plan - repetitive flight plan	X	X	X	X	X	X
Completing the flight plan	X	X	X	X	X	X
Information for flight plan obtained from - navigation flight plan - fuel plan - operator's records for basic aircraft information - mass and balance records	X	X	X	X	X	X
Filing the flight plan	X	X	X	X	X	X
Procedures for filing	X	X	X	X	X	X
Agency responsible for processing the flight plan	X	X	X	X	X	X
Requirements of the State concerning when a flight plan must be filed	X	X	X	X	X	X
Closing the flight plan	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Responsibilities and procedures	X	X	X	X	X	X
Processing agency	X	X	X	X	X	X
Checking slot time	X	X	X	X	X	X
Adherence to flight plan	X	X	X	X	X	X
Tolerances allowed by the State for various types of flight plans	X	X	X	X	X	X
In-flight amendment of flight plan	X	X	X	X	X	X
- conditions under which a flight plan must be amended						
- pilot's responsibilities and procedures for filing an amendment						
- agency to which amendments are submitted						
PRACTICAL FLIGHT PLANNING	X	X	X	X	X	X
Chart preparation	X	X	X	X	X	X
Plot tracks and measure directions and distances	X	X	X	X	X	X
Navigations plans	X	X	X	X	X	X
Completing the navigation plan using :	X	X	X	X	X	X
- tracks and distances from prepared charts						
- wind velocities as provided						
- true airspeeds as appropriate						
Simple fuel plans	X	X	X	X	X	X
Preparation of fuel logs showing planned values for		X	X	X	X	X
- fuel used on each leg						
- fuel remaining at end of each leg						
- endurance, based on fuel remaining and planned consumption rate, at end of each leg						
Radio planning practice	X	X	X	X	X	X
Communications	X	X	X	X	X	X
- frequencies and call signs of air traffic control agencies and facilities and for in-flight services such as weather information						
Navigation aids	X		X	X	X	X
- frequencies and identifiers of en-route terminal facilities, if appropriate						
IFR (AIRWAYS) FLIGHT PLANNING	X		X	X		X
Meteorological considerations	X		X	X		X
Analysis of existing weather patterns along possible routes	X		X	X		X
Analysis of winds aloft along prospective routes	X		X	X		X
Analysis of existing and forecast weather conditions at destination and possible alternates	X		X	X		X
Selection of routes to destination and alternates	X		X	X		X
Preferred airways routings	X		X	X		X
Extraction of tracks and distances from RAD/NAV chart	X		X	X		X
Frequencies and identifiers of en-route radio navigation aids	X		X	X		X
Minimum en-route altitudes, minimum crossing and reception altitudes	X		X	X		X
Standard instrument Departures (SIDs) and Standard Arrival Routes (STARs)	X		X	X		X
General flight planning tasks	X		X	X		X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Checking of AIP and NOTAM for latest airfield and en-route status information	X		X	X		X
Selection of altitudes or flight levels for each leg of the flight	X		X	X		X
Application of wind velocity on each leg to obtain heading and ground speeds	X		X	X		X
Calculation of en-route times for each leg to the destination and to the alternate and determination of total time en-route	X		X	X		X
Completion of fuel plan	X		X	X		X
Preliminary study of instrument approach procedures and minima at destination and alternate	X		X	X		X
Filling out and filling air traffic flight plan	X		X	X		X
Additional flight planning aspects for jet aeroplanes (advanced flight planning)	X					
Fuel planning <ul style="list-style-type: none"> - en-route contingency fuel - destination, holding and diversion fuel - island reserves - importance of altitude selection when planning for diversion to alternate - use of performance chart to plan fuel usage and requirements based on planned climb, en-route cruise and descent - reserve fuel requirements - influence of centre of gravity on fuel consumption 	X					
Computation of point-of-equal-time (PET) and point-of-safe-return (PSR)	X					
Computerised flight planning	X					
General principles of present systems <ul style="list-style-type: none"> - advantages - shortcoming and limitations 	X					
PRACTICAL COMPLETION OF A 'FLIGHT PLAN' (flight plan, flight log, nav log ATC plan, etc.)	X	X	X	X	X	X
Extraction of data	X	X	X	X	X	X
Extraction of navigational data	X	X	X	X	X	X
Extraction of meteorological data	X	X	X	X	X	X
Extraction of performance data	X	X	X	X	X	X
Completion of navigation flight plan	X	X	X	X	X	X
Completion of fuel plan <ul style="list-style-type: none"> - time and fuel to top-of-climb - cruise sector times and fuel used - total time and fuel required to destination - fuel required for missed approach, climb en-route altitude, and cruise alternate - reserve fuel 	X	X	X	X	X	X
Computation of PET (point-of-equal-time), including equi-fuel and equi-time points, and PSR (point-of-safe-return)	X			X	X	
Completion of air traffic flight plan	X	X	X	X	X	X
OFFSHORE OR REMOTE AREA OPERATION				X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Additional flight planning aspects for offshore or remote area operation				X	X	
Fuel planning				X	X	
<ul style="list-style-type: none"> - en route contingency fuel - destination holding and diversion fuel 						
<ul style="list-style-type: none"> - destination onshore reserve - use of performance chart to plan fuel usage and requirements based on planned climb en-route cruise and descent - reserve fuel requirements - one engine out (OEI) considerations 						
Computation of point-of-equal-time (PET) and point-of-safe-return (PSR)				X	X	
Computerised flight planning				X	X	
General principles of present systems				X	X	
<ul style="list-style-type: none"> - advantages - shortcomings and limitations 						
PERFORMANCE – HELICOPTERS				X	X	
AIRWORTHINESS – REQUIREMENTS				X	X	
DEFINITIONS OF TERMS				X	X	
<ul style="list-style-type: none"> - masses - velocities : V_{LE}, V_{LO}, V_{X1}, V_{y1} V_{toss} : (V_1) V_{NE} V_{NO} V_{mini} - velocity of best range and of maximum endurance - power limitations AEO OEI - altitudes - performance class 1, 2, 3 operations (see ICAO Annex 6 Part III. 						
TAKE OFF – CRUISE – LANDING PERFORMANCE				X	X	
<ul style="list-style-type: none"> - Use and interpretation diagrams and tables associated with CAT a, CAT b, procedures in order to select and develop class 1, 2, 3 performance profiles according to available heliport size and location (surface or elevated). 						
PERFORMANCE OF HELICOPTERS				X	X	
Applicability – Performance Class 1, 2 and 3				X	X	
General				X	X	
<ul style="list-style-type: none"> - helicopter mass - approved performance data in Helicopter Flight Manual 						
Terminology				X	X	
PERFORMANCE CLASS 1				X	X	
General and Applicability				X	X	
<ul style="list-style-type: none"> - take off from surface level heliports - take-off from elevated heliports/helidecks - critical power unit failure prior to TDP and after TDP 						
Account of :				X	X	
<ul style="list-style-type: none"> - take-off mass - pressure altitude - ambient temperature - take-off technique - head-wind component - tail-wind component 						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Take-off flight path				X	X	
- Critical power unit inoperative take-off flight path						
- Obstacle vertical and lateral margins and change of direction clearance margins						
En route critical power unit inoperative				X	X	
En route flight path				X	X	
- out of sight of the surface						
- areas of mountainous terrain						
- Visual meteorological conditions and, in sight of surface						
- flight path altitudes						
- effects of winds on the flight path						
- fuel jettisons						
- width margins flight path reductions						
Landing : to surface level heliports : to elevated heliports/helidecks : with critical power failure prior LDP and after LDP				X	X	
Account of :				X	X	
- landing mass						
- pressure altitude						
- ambient temperature						
- landing technique						
- head-wind component						
- tail-wind component						
PERFORMANCE CLASS 2				X	X	
General and Applicability				X	X	
Take-off				X	X	
- surface level heliports						
- elevated heliports/hedecks						
Take-off flight path				X	X	
- critical power unit failure prior and/or after DPATO						
En route – critical power unit inoperative				X	X	
Landing mass				X	X	
- surface level heliports						
- elevated heliports and helidecks						
PERFORMANCE CLASS 3				X	X	
General applicability aircraft certificated in either Category A or B				X	X	
- operation conducted only from aerodromes						
- heliports and route areas and diversions that permit a safe forced landing in the event of a power unit failure						
Operations – ceiling and visibility limits				X	X	
- over water in hostile environment limits						
Operations with exposure time				X	X	
Take-off				X	X	
En route				X	X	
Landing				X	X	

4. HUMAN PERFORMANCE AND LIMITATIONS

- (a). For issue of Commercial Pilot Licence, pilots of aeroplanes/helicopters shall be conversant with the Human Performance and Limitations relevant to the holder of a Commercial Pilot Licence for Aeroplane/Helicopter.
- (b). For issue of Airline Transport Pilot Licence, pilots of aeroplanes/helicopters shall be conversant with the Human Performance and Limitations relevant to the holder of a Airline Transport Pilot Licence for Aeroplane/Helicopter.
- (c). For issue of Instrument rating, pilots of aeroplanes/helicopters shall be conversant with relevant instrument flights in aeroplane/helicopter.

SYLLABUS

Note: The syllabus combines the theoretical knowledge syllabuses for Aeroplane and Helicopter. Column boxes marked with a cross ('x') indicate that knowledge of the relevant topic is required to be taught for the particular licence level. Column boxes marked with a bullet point (•) indicate that the sub-topic is NOT applicable to the particular licence level.

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Human Performance and limitations	X	X	X	X	X	X
Human Factors : basic concepts	X	X	X	X	X	X
Human Factors in aviation	X	X	X	X	X	X
Competence and limitations	X	X	X	X	X	X
Becoming a competent pilot	X	X	X	X	X	X
- the traditional approach towards 'proficiency'						
- the human factors approach towards 'professionalism'						
Accident statistics	X	X	X	X	X	X
Flight safety concepts	X	X	X	X	X	X
Basic aviation physiology and health maintenance	X	X	X	X	X	X
Basics of flight physiology	X	X	X	X	X	X
The atmosphere	X	X	X	X	X	X
- composition						
- gas Laws						
- oxygen requirement of tissues						
Respiratory and circulatory systems	X	X	X	X	X	X
- functional anatomy						
- hypobaric environment						
- pressurization, decompression						
- rapid decompression						
- entrapped gases, barotraumas						
- counter measures, hypoxia						
- symptoms						
- time of useful consciousness						
- hyperventilation						
- accelerations						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
High altitude environment - ozone - radiation - humidity	X			X		
Man and Environment the sensory system	X	X	X	X	X	X
Central and peripheral nervous system - sensory threshold, sensitivity, adaptation - habituation - reflexes and biological control systems	X	X	X	X	X	X
Vision - functional anatomy - visual field, foveal and peripheral vision - binocular and monocular vision - monocular vision cues - night vision	X	X	X	X	X	X
Hearing - functional anatomy - flight related hazards to hearing	X	X	X	X	X	X
Equilibrium - functional anatomy - motion, acceleration, verticality - motion sickness	X	X	X	X	X	X
Integration of sensory inputs - spatial disorientation - illusions - physical origin - physiological origin - psychological origin - approach and landing problems	X	X	X	X	X	X
Health and hygiene	X	X	X	X	X	X
Personal hygiene	X	X	X	X	X	X
Common minor ailments - cold - influenza - gastro-intestinal upset	X	X	X	X	X	X
Problem areas for pilots - hearing loss - defective vision - hypotension, hypertension, coronary disease - obesity - nutrition hygiene - tropical climates - epidemic diseases	X	X	X	X	X	X
Intoxication - tobacco - alcohol - drugs and self-medication - various toxic materials	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Incapacitation	X	X	X	X	X	X
- symptoms and causes						
- recognition						
- operating coping procedures						
Incapacitation	X	X	X	X	X	X
- symptoms and causes						
- recognition						
- operating coping procedures						
BASIC AVIATION PSYCHOLOGY	X	X	X	X	X	X
Human information processing	X	X	X	X	X	X
Attention and vigilance	X	X	X	X	X	X
- selectivity of attention						
- divided attention						
Perception	X	X	X	X	X	X
- perceptual illusions						
- subjectivity of perception						
- 'bottom-up'/'top-down' processing						
Memory	X	X	X	X	X	X
- sensory memory						
- working memory						
- long term memory						
- motor memory (skills)						
Response selection	X	X	X	X	X	X
- learning principles and techniques						
- drives						
- motivation and performance						
Human error and rehabilitee	X	X	X	X	X	X
Reliability of human behaviour	X	X	X	X	X	X
Hypotheses on reality	X	X	X	X	X	X
- similarity, frequency						
- completion causality						
Theory and model of human error	X	X	X	X	X	X
Error generation	X	X	X	X	X	X
- internal factors (cognitive styles)						
- external factors						
- ergonomics						
- economics						
- social environment (group. Organization)						
Decision making	X	X	X	X	X	X
Decision-making concepts	X	X	X	X	X	X
- structure (phases)						
- limits						
- risk assessment						
- practical application						
Avoiding and managing errors : cockpit management	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Safety awareness	X	X	X	X	X	X
- risk area awareness						
- identification of error proneness (oneself)						
- identification of error sources (others)						
- situational awareness						
Co-ordination (multi-crew concepts)	X			X		
Co-operation	X			X		
- small group dynamics						
- leadership, management styles						
- duty and role						
Communication	X	X	X	X	X	X
- communication model (s)						
- verbal and non-verbal communication						
- communication barriers						
- conflict management						
Personality	X	X	X	X	X	X
Personality and attitudes	X	X	X	X	X	X
- development						
- environmental influences						
Individual differences in personality	X	X	X	X	X	X
- self-concepts (e.g. action vs, state-orientation)						
Identification of hazardous attitudes (error proneness)	X			X		
Human overload and under load	X	X	X	X	X	X
Arousal	X	X	X	X	X	X
Stress	X	X	X	X	X	X
- definition(s), concept(s), model (s)						
- anxiety and stress						
- effects of stress						
Fatigue	X	X	X	X	X	X
- types, causes, symptoms						
- effects of fatigue						
Body rhythm and sleep	X	X	X	X	X	X
- rhythm disturbances						
- symptoms, effects, management						
Fatigue and stress management	X	X	X	X	X	X
- coping strategies						
- management techniques						
- health and fitness programmes						
- relaxation techniques						
- religious practices						
- counselling techniques						
Advanced cockpit automation	X	X	X	X	X	X
Advantages and disadvantages (criticalities)	X	X	X	X	X	X
Automation complacency	X	X	X	X	X	X
Working concepts	X			X		

5. METEOROLOGY

- (a). For Issue of Commercial Pilot Licence, pilots of Aeroplane/Helicopter shall be conversant with,
- i. Interpretation and application of aeronautical meteorological reports, charts and forecasts, use of, and procedures for obtaining, meteorological information, pre-flight and in-flight, altimetry,
 - ii. Aeronautical meteorology; climatologic of relevant areas in respect of the elements having an effect upon aviation, the movement of pressure systems, the structure of fronts, and the origin and characteristics of significant weather phenomena which affect take-off, en-route and landing conditions, hazardous weather avoidance,
relevant to the holder of a Commercial Pilot Licence for Aeroplane/Helicopter.
- (b) For Issue of Airline Transport Pilot Licence, pilots of Aeroplane/Helicopter shall be conversant with,
- i. Interpretation and application of aeronautical meteorological reports, charts and forecasts, codes and abbreviations; use of, and procedures for obtaining, meteorological information, pre-flight and in-flight, altimetry,
 - ii. Aeronautical meteorology; climatology of relevant areas in respect of the elements having an effect upon aviation, the movement of pressure systems; the structure of fronts, and the origin and characteristics of significant weather phenomena which effect take-off, en-route and landing conditions,
 - iii. Causes, recognition and effects of engine and airframe icing, frontal zone penetration procedures; hazardous weather avoidance,
 - iv. Practical high altitude meteorology, including interpretation and use of weather reports, charts and forecasts, jet streams (this Para is applicable for pilots for aeroplanes only),
relevant to the holder of an Airline Transport Pilot Licence for Aeroplane/Helicopter.
- (c). For issue of Instrument Rating, pilots of aeroplanes/helicopters shall be conversant with,
- i. application of aeronautical meteorology, interpretation and use of reports, charts and forecasts, codes and abbreviations; use of, and procedures for obtaining, meteorological information, altimetry,
 - ii. causes , recognition and effects of engine and airframe icing, frontal zone penetration procedures, hazardous weather avoidance,
relevant instrument flights in aeroplane/helicopter.

SYLLABUS

Note: The syllabus combines the theoretical knowledge syllabuses for Aeroplane and Helicopter. Column boxes marked with a cross ('x') indicate that knowledge of the relevant topic is required to be taught for the particular licence level. Column boxes marked with a bullet point (●) indicate that the sub-topic is NOT applicable to the particular licence level.

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
METEOROLOGY	X	X	X	X	X	X
THE ATMOSPHERE	X	X	X	X	X	X
Composition, extent, vertical division	X	X	X	X	X	X
Composition, extent, vertical division	X	X	X	X	X	X
Temperature	X	X	X	X	X	X
Vertical distribution of temperature	X	X	X	X	X	X
Transfer of heat	X	X	X	X	X	X
- solar and terrestrial radiation						
- conduction						
- convection						
- advection and turbulence						
Lapse rate, stability and instability	X	X	X	X	X	X
Development of inversions, types of inversions	X	X	X	X	X	X
Temperature near the earth's surface, surface effects, diurnal variation, effect of clouds, effect of wind	X	X	X	X	X	X
Atmospheric pressure	X	X	X	X	X	X
Barometric pressure, isobars	X	X	X	X	X	X
Pressure variation with height, contours (isohypses)	X	X	X	X	X	X
Reduction of pressure to mean sea level, OFF	X	X	X	X	X	X
Surface low/upper-air low, surface high/upper-air high	X	X	X	X	X	X
Atmospheric density	X	X	X	X	X	X
Interrelationship of pressure, temperature and density	X	X	X	X	X	X
International Standard Atmosphere (ISA)	X	X	X	X	X	X
International Standard Atmosphere	X	X	X	X	X	X
Altimetry	X	X	X	X	X	X
Pressure altitude, true altitude	X	X	X	X	X	X
Height, altitude, flight level	X	X	X	X	X	X
Altimeter settings : QNH, QFE, 1013.25 hPa	X	X	X	X	X	X
Calculation of terrain clearance, lowest usable flight level, rule of thumb for temperature and pressure influences	X		X	X		X
Effect of accelerated airflow due to topography	X	X	X	X	X	X
WIND	X	X	X	X	X	X
Definition and measurement	X	X	X	X	X	X
Definition and measurement	X	X	X	X	X	X
Primary cause of wind	X	X	X	X	X	X
Primary cause of wind, pressure gradient, coriolis force, gradient wind	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Relationship between isobars and wind	X	X	X	X	X	X
Effects of convergence and divergence	X			X	X	
General circulation	X	X	X	X	X	X
General circulation around the globe	X	X	X	X	X	X
Turbulence	X	X	X	X	X	X
Turbulence and gustiness, types of turbulence	X	X	X	X	X	X
Origin and location of turbulence	X	X	X	X	X	X
Variation of wind with height	X	X	X	X	X	X
Variation of wind in the friction layer	X	X	X	X	X	X
Variation of the wind cause by fronts	X			X	X	
Local winds	X	X	X	X	X	X
Anabatic and catabatic winds, land and sea breezes, venturi effects	X	X	X	X	X	X
Jet streams	X			X		
Origin of jet streams	X			X		
Description and location of jet streams	X			X		
Names, heights and seasonal occurrence of jet streams	X			X		
Jet stream recognition	X			X		
CAT : cause, location and forecasting	X			X		
Standing waves	X	X	X	X	X	X
Origin of standing waves	X	X	X	X	X	X
THERMODYNAMICS	X	X	X	X	X	X
Humidity	X	X	X	X	X	X
Water vapour in the atmosphere	X	X	X	X	X	X
Temperature/dewpoint, mixing ratio, relative humidity	X	X	X	X	X	X
Change of state of aggregation	X		X	X	X	X
Condensation, evaporation, sublimation, freezing and melting, latent heat	X		X	X	X	X
Adiabatic processes	X		X	X	X	X
Adiabatic processes	X		X	X	X	X
CLOUDS AND FOG	X	X	X	X	X	X
Cloud formation and description	X	X	X	X	X	X
Cooling by adiabatic expansion and by advection	X		X	X	X	X
Cloud types, cloud classification	X	X	X	X	X	X
Influence of inversions on cloud development	X	X	X	X	X	X
Flying conditions in each cloud type	X		X	X		X
Fog, mist, haze	X	X	X	X	X	X
Radiation fog	X	X	X	X	X	X
Advection fog	X	X	X	X	X	X
Steaming fog	X	X	X	X	X	X
Frontal fog	X	X	X	X	X	X
Orographic fog	X	X	X	X	X	X
PRECIPITATION	X	X	X	X	X	X
Development of precipitation	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Development of precipitation	X	X	X	X	X	X
Types of precipitation	X	X	X	X	X	X
Types of precipitation, relationship with cloud types	X	X	X	X	X	X
AIRMASSES AND FRONTS	X	X	X	X	X	X
Types of air masses	X	X	X	X	X	X
Description, factors affecting the properties of an air mass	X	X	X	X	X	X
Classification of air masses, modifications of air masses, areas of origin	X	X	X	X	X	X
Fronts	X	X	X	X	X	X
Boundaries between air masses (fronts), general situation, geographic differentiation	X	X	X	X	X	X
Warm front, associated clouds and weather	X	X	X	X	X	X
Cold front, associated clouds and weather	X	X	X	X	X	X
Warm sector, associated clouds and weather	X	X	X	X	X	X
Weather behind the cold front	X	X	X	X	X	X
Occlusions, associated clouds and weather	X	X	X	X	X	X
Stationary front, associated clouds and weather	X	X	X	X	X	X
Movement of fronts and pressure systems, life cycle	X	X	X	X	X	X
PRESSURE SYSTEMS	X	X	X	X	X	X
Location of the principal pressure areas	X	X	X	X	X	X
Location of the principal pressure areas	X	X	X	X	X	X
Anticyclone	X	X	X	X	X	X
Anticyclones, types, general properties, cold and warm anticyclones, ridges subsidence	X	X	X	X	X	X
Non frontal depressions	X	X	X	X	X	X
Thermal, orographic and secondary depressions, cold air pools, troughs	X	X	X	X	X	X
Tropical revolving storms	X			X	X	
Development of tropical revolving storms	X			X	X	
Origin and local names, location and period of occurrence	X			X	X	
CLIMATOLOGY	X	X	X	X	X	X
Climatic zones	X			X	X	
General seasonal circulation in the troposphere and lower stratosphere	X			X	X	
Tropical rain climate, dry climate, mid-latitude climate, sub-arctical climate with cold winter, snow climate	X			X	X	
Tropical climatology	X			X	X	
Cause and development of tropical showers : humidity, temperature, tropopause	X			X	X	
Seasonal variations of weather and wind, typical synoptic situations	X			X	X	
Intertropical convergence zone (ITCZ), weather in the ITCZ, general seasonal movement	X			X	X	
Climatic elements relative to the area (monsoon, tradewinds, sandstorms, cold air outbreaks)	X			X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Easterly waves	X			X	X	
Typical weather situations in mid-latitudes	X	X	X	X	X	X
Westerly waves	X	X	X	X	X	X
High pressure area	X	X	X	X	X	X
Uniform pressure pattern	X	X	X	X	X	X
Cold pool	X	X	X	X	X	X
Local seasonal weather and wind	X	X	X	X	X	X
Local seasonal weather and wind	X	X	X	X	X	X
FLIGHT HAZARDS	X	X	X	X	X	X
Icing	X	X	X	X	X	X
Weather conditions for ice accretion, topographical effects	X	X	X	X	X	X
Types of ice accretion	X		X	X	X	X
Hazards of ice accretion, avoidance	X		X	X	X	X
Turbulence	X	X	X	X	X	X
Effects on flight, avoidance	X	X	X	X	X	X
CAT : effects on flight	X			X	X	X
Windshear	X	X	X	X	X	X
Definition of windshear	X	X	X	X	X	X
Weather conditions for windshear	X	X	X	X	X	X
Effects on flight	X	X	X	X	X	X
Thunderstorms	X	X	X	X	X	X
Structure of thunderstorms, squall lines, life history, storm cells, electricity in the atmosphere, static charges	X	X	X	X	X	X
Conditions for and process of development, forecast, location, type specification	X	X	X	X	X	X
Thunderstorm avoidance, ground/airborne radar, stormscope	X	X	X	X	X	X
Development and effect of downbursts	X	X	X	X	X	X
Development of lightning discharges and effect of lightning strike on aircraft and flight execution	X	X	X	X	X	X
Tornadoes	X			X	X	X
Occurrence	X			X	X	X
Low and high level inversions	X	X	X	X	X	X
Influence on aircraft performance	X	X	X	X	X	X
Stratospheric conditions	X			X	X	X
Tropopause influence on aircraft performance	X			X	X	X
Effect of ozone, radioactivity	X			X	X	X
Hazards in mountainous areas	X	X	X	X	X	X
Influence of terrain on clouds and precipitation, frontal passage	X	X	X	X	X	X
Vertical movements, mountain waves, windshear, turbulence, ice accretion	X	X	X	X	X	X
Development and effect of valley inversions	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Visibility reducing phenomena	X	X	X	X	X	X
Reduction of visibility cause by mist, smoke, dust, sand and precipitation	X	X	X	X	X	X
Reduction of visibility cause by low drifting and blowing snow	X	X	X	X	X	X
Micro meteorology				X	X	
METEOROLOGICAL INFORMATION	X	X	X	X	X	X
Observation	X	X	X	X	X	X
On the ground – surface wind, visibility and runway visual range, transmission meters : Clouds – type, amount, height of base and tops, movement : Weather – including all types of precipitation, air temperature, relative humidity, dewpoint, atmospheric pressure	X	X	X	X	X	X
Upper air observations	X		X	X	X	X
Satellite observation, interpretation	X		X	X	X	X
Weather radar observations ground and airborne, interpretation	X		X	X	X	X
Aircraft observations and reporting, date line systems, PIREPS	X	X	X	X	X	X
Weather charts	X	X	X	X	X	X
Significant weather charts	X	X	X	X	X	X
Surface charts	X	X	X	X	X	X
Upper air charts	X	X	X	X	X	X
Symbols and signs on analysed and prognostic charts	X	X	X	X	X	X
Information for flight planning	X	X	X	X	X	X
Aeronautical codes : METAR, TAF, SPECI, SIGMET, SNOWTAM, runway report	X	X	X	X	X	X
Meteorological broadcasts for aviation : VOLMET, ATIS, HF-VOLMET, ACARS	X	X	X	X	X	X
Content and use of pre-flight meteorological documents	X	X	X	X	X	X
Meteorological briefing and advice	X	X	X	X	X	X
Measuring and warning systems for low level windshear, inversion	X	X	X	X	X	X
Special meteorological warnings	X	X	X	X	X	X
Information for computer flight planning	X			X	X	

6. NAVIGATION

- (a). For issue of Commercial Pilot licence for aeroplanes/helicopters, pilots shall be conversant with Air Navigation, including the news of aeronautical charts, instruments and navigation aids, an understanding of the principles and characteristics of appropriate navigation systems, operation of airborne equipments relevant to the holder of a Commercial Pilot Licence for aeroplane/helicopter.
- (b). For issue of Airline Transport Pilot licence for aeroplanes/helicopters, pilots shall be conversant with,
- i. Air navigation, including the use of aeronautical charts, radio navigation aids and area navigation systems, specific navigation requirements for long-range flights;
 - ii. Use, limitation and serviceability of avionics and instruments necessary for the control and navigation of aeroplanes/helicopters;
 - iii. Use, accuracy and reliability of navigation systems used in departure, en-route, approach and landing phases of flight, identification of radio navigation aids and
 - iv. Principles and characteristics of self-contained and external-referenced navigation systems, operation of airborne equipment,
relevant to the holder of an Airline Transport Pilot Licence for aeroplane/helicopter.
- (c). For issue of Instrument Ratings for aeroplanes/helicopters, pilots shall be conversant with,
- i. practical air navigation using radio navigation aids,
 - ii. use, accuracy and reliability of navigation systems used in departure, en-route, approach and landing phases of flight, identification of radio navigation aids,
relevant to the holder of an Instrument Rating for aeroplane/helicopter.

SYLLABUS

Note: The syllabus combines the theoretical knowledge syllabuses for Aeroplane and Helicopter. Column boxes marked with a cross ('x') indicate that knowledge of the relevant topic is required to be taught for the particular licence level. Column boxes marked with a bullet point (•) indicate that the sub-topic is NOT applicable to the particular licence level.

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
NAVIGATION	X	X	X	X	X	X
GENERAL NAVIGATION	X	X	X	X	X	X
BASICS OF NAVIGATION	X	X		X	X	
The solar system - seasonal and apparent movements of the sun	X	X		X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
<p>The earth</p> <ul style="list-style-type: none"> - great circle, small circle, rhumb line - convergency, conversion angle - latitude, difference of latitude - longitude, difference of longitude - use of latitude and longitude co-ordinates to locate any specific position 	X	X		X	X	
<p>Time and time conversions</p> <ul style="list-style-type: none"> - apparent time - UTC - LMT - standard times - dateline - determination of sunrise, sunset and civil twilight 	X	X		X	X	
<p>Directions</p> <ul style="list-style-type: none"> - terrestrial magnetism : declination, deviation and compass variations - magnetic poles, isogonals, relationship between true and magnetic - gridlines, isogrives 	X	X		X	X	
<p>Distance</p> <ul style="list-style-type: none"> - units of distance and height used in navigation : nautical miles, statute miles, kilometres, metres, yards and feet - conversion from one unit to another - relationship between nautical miles and minutes of latitude 	X	X		X	X	
MAGNEISM AND COMPASSES	X	X		X	X	
<p>General principles</p> <ul style="list-style-type: none"> - terrestrial magnetism - resolution of the earth's total magnetic force into vertical and horizontal components - the effects of change of latitude on these components - directive force - magnetic dip - variation 	X	X		X	X	
<p>Aircraft magnetism</p> <ul style="list-style-type: none"> - hard iron and vertical soft iron - the resulting magnetic fields - the variation in directive force - change of deviation with change of latitude and with change in the aircraft's heading - turning and acceleration errors - keeping magnetic materials clear of the compass 	X	X		X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Knowledge of the principles, standby and landing or main compasses and remote reading compasses <ul style="list-style-type: none"> - detailed knowledge of the use of these compasses - serviceability tests - advantages and disadvantages of the remote indicating compass - adjustment and compensation of direct reading magnetic compass 	X	X		X	X	
CHARTS	X	X	X	X	X	X
General properties of miscellaneous types of projections <ul style="list-style-type: none"> - Mercator - Lambert conformal conic - polar stereographic - transverse mercator - oblique mercator 	X	X		X	X	
The representation of meridians, parallels, great circles and rhumb lines <ul style="list-style-type: none"> - direct Mercator - Lambert conformal conic - polar stereographic 	X	X		X	X	
The use of current aeronautical charts <ul style="list-style-type: none"> - plotting positions - methods of indicating scale and relief - conventional signs - measuring tracks and distances - plotting bearings 	X	X	X	X	X	X
DEAD RECKONING NAVIGATION (DR)	X	X		X	X	
Basics of dead reckoning <ul style="list-style-type: none"> - track - heading (compass, magnetic, true, grid) - wind velocity - airspeed (IAS, CAS, TAS, Mach number) - groundspeed - ETA - drift, wind correction angle - DR-position, fix 	X	X		X	X	
Use of the navigational computer <ul style="list-style-type: none"> - speed - time - distance - fuel consumption - conversions 	X	X		X	X	
<ul style="list-style-type: none"> - heading - wind velocity 						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
The triangle of velocities, methods of solution for the determination of <ul style="list-style-type: none"> - heading - ground speed - wind velocity - wind velocity - track and drift angle, track error - time and distance problems 	X	X		X	X	
Determination of DR position <ul style="list-style-type: none"> - need for DR - confirmation of flight progress (mental DR) - lost procedures - heading and TAS vector since last confirmed position - application of wind velocity vector - last known track and ground speed vector - assessment of accuracy of DR position 	X	X		X	X	
Measurement of DR elements <ul style="list-style-type: none"> - calculation of altitude, adjustments, corrections, errors - determination of temperature - determination of appropriate speed - determination of mach number 	X	X		X	X	
Resolution of current DR problems by means of <ul style="list-style-type: none"> - Mercator charts - Lambert charts - polar stereographic projections 	X	X		X	X	
Measurements of <ul style="list-style-type: none"> - maximum range - radius of action - point-of-safe-return and point-of-equal-time 	X	X		X	X	
Miscellaneous DR uncertainties and practical means of correction	X	X		X	X	
IN-FLIGHT NAVIGATION	X	X		X	X	
Use of visual observations and application to in-flight navigation	X	X		X	X	
Navigation in climb and descent <ul style="list-style-type: none"> - average airspeed - average wind velocity - ground speed/distance covered during climb or descent 	X	X		X	X	
Navigation in cruising flight, use of fixes to revise navigation data as <ul style="list-style-type: none"> - ground speed revision - off-track corrections - calculation of wind speed and direction - ETA revisions 	X	X		X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Flight log (including navigation records)	X	X		X	X	
Purposes of FMS (flight management systems)	X			X	X	
INERTAIL NAVIGATUIB SYSTEMS (INS)	X					
Principles and practical application <ul style="list-style-type: none"> - gyroscopic principles - platform mounting - accelerometer principles - integrator principles - Shuler-tuned platform - navigation computer - strapdown systems 	X					
Alignment procedures <ul style="list-style-type: none"> - gyros compassing - levelling 	X					
Accuracy, reliability, errors and coverage	X					
Flight deck equipment and operation <ul style="list-style-type: none"> - mode selector unit (MSU) - control display unit (CDU) - horizontal situation indicator (HSI) 	X					
INS operation <ul style="list-style-type: none"> - normal flight, position and waypoint entries - flight plan changes - bypassing waypoint - change of waypoint data - system check and updating 	X					
RADIO NAVIGATION	X	X	X	X	X	X
RADIO AIDS	X	X	X	X	X	X
Ground D/F (including classification of bearing) <ul style="list-style-type: none"> - principles - presentation and interpretation - coverage - range - errors and accuracy - factors affecting range and accuracy 	X	X	X	X	X	X
ADF (including associated beacons and use of the radio magnetic indicator) <ul style="list-style-type: none"> - principles - presentation and interpretation - coverage - range - errors and accuracy - factors affecting range and accuracy 	X	X	X	X	X	X
VOR and Doppler-VOR (including the use of the radio magnetic indicator) <ul style="list-style-type: none"> - principles - presentation and interpretation - coverage - range - errors and accuracy - factors affecting range and accuracy 	X	X	X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
DME (distance measuring equipment) - principles - presentation and interpretation - coverage - range - errors and accuracy - factors affecting range and accuracy	X	X	X	X	X	X
ILS (instrument landing system) - principles - presentation and interpretation - coverage - range - errors and accuracy - factors affecting range and accuracy	X		X	X		X
MLS (microwave landing systems) - principles - presentation and interpretation - coverage - range - errors and accuracy - factors affecting range and accuracy	X		X	X		X
BASIC RADAR PRINCIPLES	X	X	X	X	X	X
Pulse techniques and associated terms	X		X	X	X	X
Ground radar - principles - presentation and interpretation - coverage - range - errors and accuracy - factors affecting range and accuracy	X		X	X	X	X
Airborne weather radar - principles - presentation and interpretation - coverage - range - errors and accuracy - factors affecting range and accuracy - application for navigation	X		X	X		X
SSR secondary surveillance radar and transponder - principles - presentation and interpretation - modes and codes, including mode S	X	X	X	X	X	X
Use of radar observations and application to in-flight navigation	X			X	X	
AREA NAVIGATION SYSTEMS	X		X	X	X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
General philosophy - use of radio navigation systems or an inertial navigation system	X		X	X		X
Typical flight deck equipment and operation - means of entering and selecting waypoints and desired course information (keyboard entry system) - means of selecting, tuning and identifying ground stations - instrumentation for en-route course guidance - for some types of systems, instrumentation for presenting distance travelled, distance to go and if necessary, ground speed information - instrumentation for presenting current position data	X		X	X		X
Instrument indications	X		X	X		X
Types of area navigation system inputs - self-contained on-board systems (inertial navigation systems, doppler) - external sensor systems (VOR/DME, LORAN-C, Decca) - air data inputs (true airspeed, altitude, magnetic heading)	X		X	X		X
VOR/DME area navigation (RNAV) - principle of operation - advantages and disadvantages - accuracy, reliability, coverage - flight deck equipment	X		X	X		X
Flight director and autopilot coupling	X			X	X	
SELF-CONTAINED AND EXTERNAL-REFERENCED NAVIGATION SYSTEMS	X	X	X	X	X	X
Doppler - principles of operation (airborne system) - ground speed and drift calculation - advantages and disadvantages - accuracy and reliability - flight deck equipment	X			X		
Loran –C - principle of operation	X			X	X	
Decca navigation system - principle of operation	X			X	X	
Satellite assisted navigation : GPS/GLONASS/DGPS - principle of operation - advantages and disadvantages	X	X	X	X	X	X

7. OPERATIONAL PROCEDURES

- (a). i. For issue of Commercial Pilot licence for aeroplanes, pilots shall be conversant with,
- Use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations,
 - Appropriate precautionary and emergency procedures,
 - Operational procedures for carriage of freight, potential hazards associated with dangerous goods,
 - Requirements and practices for safety briefing to passengers, including precautions to be observed when embarking and disembarking from aeroplanes,
- relevant to the holder of a Commercial Pilot Licence for aeroplane.
- ii. For issue of Commercial Pilot licence for helicopters, pilots shall be conversant with,
- Use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations,
 - Appropriate precautionary and emergency procedures, including action to be taken to avoid hazardous weather and wake turbulence, settling with power, ground resonance, roll-over and other operating hazards,
 - Operational procedures for carriage of freight, including external loads, potential hazards associated with dangerous goods,
 - Requirements and practices for safety briefing to passengers, including precautions to be observed when embarking and disembarking from helicopters,
- relevant to the holder of a Commercial Pilot Licence for helicopter.
- (b). i. For issue of Airline Transport Pilot licence for aeroplanes, pilots shall be conversant with,
- Interpretation and use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations, and instrument procedure charts for departure, en-route, descent and approach,
 - Precautionary and emergency procedures, safety practices associated with flight under IFR,
 - Operational procedures for carriage of freight and dangerous goods,
 - Requirements and practices for safety briefing to passengers, including precautions to be observed when embarking and disembarking from aeroplanes,
- relevant to the holder of an Airline Transport Pilot Licence for aeroplane.

- ii. For issue of Airline Transport Pilot licence for helicopters, pilots shall be conversant with,
- Interpretation and use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations,
 - Precautionary and emergency procedures, settling with power, ground resonance, retreating blade stall, dynamic roll-over and other operating hazards, safety practices associated with flight under VFR,
 - Operational procedures for carriage of freight, including external loads, and dangerous goods,
 - Requirements and practices for safety briefing to passengers, including precautions to be observed when embarking and disembarking from helicopters,
- relevant to the holder of an Airline Transport Pilot Licence for helicopter.
- (c). For issue of Instrument Ratings for aeroplanes/helicopters, pilots shall be conversant with,
- i. Interpretation and use of aeronautical documentation such as AIP, NOTAM, aeronautical codes and abbreviations, and instrument procedure charts for departure, en-route, descent and approach,
 - ii. Precautionary and emergency procedures, safety practices associated with flight under IFR,
- relevant to the holder of an Instrument Rating for aeroplane/helicopter.

SYLLABUS

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	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
OPERATIONAL PROCEDURES	x	x	x	x	x	x
OPERATIONAL PROCEDURES – AEROPLANE	x	x				
OPERATIONAL PROCEDURES – SPECIAL AND EMERGENCY PROCEDURES -				x	x	
OPERATIONAL PROCEDURES – AIRCRAFT			x			x
GENERAL	x	x	x	x	x	x

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
ICAO Annex 6, Parts I, II and III (as applicable- - definitions - applicability - general framework and contents	X	X		X	X	
JAR-OPS-Requirements	X	X	X	X	X	X
General requirements about : - quality system - additional crew members - method of carriage of persons - admission to flight deck - unauthorized carriage - portable electronic devices - endangering safety - additional information's and forms to be carried - information's retained on ground - power to inspect - production of documentation and records - preservation of documentation - leasing	X	X		X	X	
Operator certification and supervision requirements : - general rules for Air Operator Certification issue - variation and continued validity of an AOC - administrative requirements	X	X		X	X	
Operational procedures requirements : - operational control and supervision ' - use of Air Traffic Services - instrument departure and approach procedures - carriage of person with reduce mobility - carriage of inadmissible passengers, deportees or persons in custody - stowage of baggage and cargo - passengers seating - securing of passenger cabin and galley (s) - smoking on board - take-off conditions - application of take-off minimas	X	X		X	X	
All weather operations requirements : low visibility operations - Aerodrome Operating Minimas – General - Terminology - Low visibility operations –General operating rules - Low visibility operations – Aerodrome considerations - Low visibility operations – Training and qualifications - Low visibility operations – Operating procedures - Low visibility operations – Minimum equipment - VFR Operating minima	X	X ● ● ● ● ● ● ● ●	X	X	X ● ● ● ● ● ● ●	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Instrument and safety equipment requirements : - general introduction - circuit protection devices - windshield wipers - airborne weather radar equipment - flight crew interphone system - public address system - internal doors and curtains - first aid kits - emergency medical kit - first aid kits - emergency medical kit - first aid oxygen - supplemental oxygen –pressurized aeroplanes - supplemental oxygen – non-pressurised aeroplanes - crew protective breathing equipment - hand fire extinguishers - crash axes and crowbars - marking of break-in points - means for emergency evacuation - megaphones - emergency lightings - automatic emergency locator transmitter - life jackets - life rafts and survival ELTs for extended overwater flights - survival equipment	X	X		X	X	
Communication and navigation equipment requirements : - radio equipment - audio selector panel - radio equipment VFR - communication and navigation IFR and VFR	X	X • •		X	X • •	
Aircraft maintenance : - terminology - application for and approval of the operator's maintenance system - maintenance management - quality system - operator's maintenance management exposition - operator's aircraft maintenance program - continued validity of the Air Transport Operators Licence in respect of maintenance system - equivalent safety case	X	X		X	X	
Flight crew	X	X		X	X	
Flight and Duty Time limitations and rest requirements (Reserved)	X	X		X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Cabin crew	X	X		X	X	
Navigation requirements for long-range flights	X					
Flight management	X					
- navigation planning procedures						
- completion of flight plans						
- choice of route, speed, altitude						
- selection of alternate aerodrome						
- minimal time routes, definition						
Transoceanic and polar flight (ICAO) Doc. 7030 – Regional Supplementary Procedures)	X					
- choice of the emergency means for the determination of course and INS cross-checks						
- cross-checks						
- determination of tracks and course						
- polar tracks						
- terrestrial magnetism characteristic in polar zones						
- specific problems of polar navigation						
MNPS Airspace (ICAO Doc. 7030- Regional Supplementary Procedures, NAT Doc.001, T 13 5N/5-Guidance and information material concerning air navigation in the NAT Region, North Atlantic MNPS Airspace Operations Manual, and RVSM)	X					
- definition						
- geographical limits						
- regulations and procedures						
- notices						
SPECIAL OPERATIONAL PROCEDURES AND HAZARDS (GENERAL ASPECTS)	X	X	X	X	X	X
Minimum equipment list	X	X		X	X	
- AFM						
Ground de-icing	X	X		X	X	
- icing conditions						
- definition and recognition, on ground/in flight						
- de-icing, anti-icing, types of de-icing fluids						
- performance deterioration, on ground/in flight						
Bird strike risk and avoidance	X	X		X	X	
Noise abatement	X	X		X	X	
- influence of the flight procedure (departure, cruise, approach)						
- influence by the pilot (power setting, low drag, low power)				●	●	
- influence by the pilot (power setting, track of helicopter)	●	●				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Fire / smoke	X	X		X	X	
- carburettor fire						
- engine fire						
- fire in the cabin, cockpit, freight compartment (choice of appropriate fire extinguishing agents according to fire classification and use of the extinguishers)				•	•	
- actions in case of overheated brakes after aborted take off and landing						
- smoke in the cockpit and cabin (effects and action taken)						
Decompression of pressurized cabin	X	X				
- slow decompression						
- rapid or explosive decompression						
- dangers and action taken						
Windshear, microburst	X	X		X	X	
- definition and description						
- effects and recognition during departure and approach						
- actions to avoid and actions taken during encounter						
Wake turbulence	X	X	X	X	X	X
- cause						
- influence of speed and mass, wind						
- actions taken when crossing traffic, during take-off and landing						
Security	X	X		X	X	
- unlawful events						
Emergency and precautionary landings	X	X		X	X	
Operations in various terrain – water (i.e. slopes, mountains, jungle, offshore)	•	•				
- definition						
- cause						
- factors to be considered (wind, terrain, preparation, flight tactics, landing in various terrain and water)						
- passenger information						
- evacuation						
- action after landing						
Fuel jettisoning	X	X		X	X	
- safety aspects						
- legal aspects						
Transport of dangerous goods	X	X		X	X	
- Annex 18						
- practical aspects						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Contaminated runways	X	X		X	X	
- kinds of contamination						
- braking action, brake coefficient						
- performance corrections and calculations				●	●	
Rotor downwash				X	X	
Operation				X	X	
Influence by meteorological conditions i.e.						
- icing						
- white out						
- strong winds						
- windshear, microburst						
EMERGENCY PROCEDURES				X	X	
Influence by technical problems i.e.						
- engine failure						
- fire in cabin cockpit engine						
- tail/rotor/directional control failure						
- ground/resonance						
- blade/stall						
- setting with power (vortex ring)						
- overpitch						
- overspeed						
- sudden stoppage						
- dynamic rollover/mast bumping						

8. PRINCIPLES OF FLIGHT

- (a). For issue of Commercial Pilot licence for aeroplanes/helicopters, pilots shall be conversant with principles of flight relating to aeroplanes/helicopters.
- (b). i. For issue of Airline Transport Pilot licence for aeroplanes, pilots shall be conversant with principles of flight relating to aeroplanes, sub-sonic aerodynamics, compressibility effects, manoeuvre boundary limits, wing design characteristics, effects of supplementary lift and drag devices, relationships between lift, drag and thrust at various airspeeds and in different flight configurations,
- ii. For issue of Airline Transport Pilot licence for helicopters, pilots shall be conversant with principles of flight relating to helicopters.

SYLLABUS

Note: The syllabus combines the theoretical knowledge syllabuses for Aeroplane and Helicopter. Column boxes marked with a cross ('x') indicate that knowledge of the relevant topic is required to be taught for the particular licence level. Column boxes marked with a bullet point (•) indicate that the sub-topic is NOT applicable to the particular licence level.

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
PRINCIPLES OF FLIGHT	X	X		X	X	
PRINCIPLES OF FLIGHT – AEROPLANE	X	X				
SUBSONIC AERODYNAMICS	X	X				
Basics, laws and definitions	X	X				
Laws and definitions	X	X				
- units						
- laws of Newton						
- ideal gas equation						
- equation of impulse						
- equation of continuity						
- Bernoulli's theorem						
- static pressure						
- dynamic pressure						
- viscosity						
- density						
- IAS, CAS, EAS, TAS						
Basics about airflow	X	X				
- stationary airflow						
- not stationary airflow						
- streamline						
- stream tube						
- two-dimensional airflow						
- three-dimensional airflow						

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Aerodynamic forces on surfaces - resulting air force - lift - drag - angle of attack - forces and equilibrium - of forces during climb, level, descent and turn	X	X				
Shape of an aerofoil - thickness to chord ratio - chord line - camber line - nose radius - camber - angle of attack - angle of incidence	X	X				
The wing shape - aspect ration - root chord - tip chord - tapered wings - shape of wing surface - mean aerodynamic chord (MAC)	X	X				
The two-dimensional airflow about an aerofoil	X	X				
Streamline pattern	X	X				
Stagnation point	X	X				
Pressure distribution	X	X				
Centre of pressure/Cma.c.	X	X				
Lift and downwash	X	X				
Drag and wake (loss of impulse)	X	X				
Influence of angle of attack	X	X				
Flow separation at high angles of attack	X	X				
The Lift – a graph	X	X				
The coefficients	X	X				
The lift coefficient C_L - the lift formula - c_L - α graph - C_{Lmax} and α - Normal Values of C_L max, α crit, α stall and the slope of the C/A.o.A curve	X	X				
The drag coefficient C_d - the drag formula : - zero lift drag - lift induce drag - C_d - α graph - C_L - C_d graph, profile polar - C_L - C_d ratio - normal values of the $C_L - C_d$ ratio	X	X				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
The three-dimensional airflow about an aeroplane	X	X				
Streamline pattern <ul style="list-style-type: none"> - span-wise flow and causes - tip vortices and local α - tip vortices and angle of attack - up-wash and down-wash due to tip vortices - span-wise lift distribution - wake turbulence behind an aircraft (causes, distribution, duration of the phenomenon) 	X	X				
Induced drag <ul style="list-style-type: none"> - influence of tip vortices on the angle of attack - the induced local α - Influence of induced angle of attack on the direction of the lift vector - Induced drag and angle of attack - Induced drag and speed - Induced drag and speed - Induced drag and wing aspect ratio - Induced drag and wing planform - Induced drag coefficient - Induced drag coefficient and angle of attack - Influence of the induced drag on the $C_L - \alpha$ Graph 	X	X				
<ul style="list-style-type: none"> - influence of the induced drag on the $C_L - C_D$ graph, airplane polar, lift drag ratio - parabolic airplane polar in a graph and as a formula - influence of plan of section - winglets - tip-tanks - wing span loading - influence of wing twist - influence of change of camber 						
- The total drag	X	X				
<ul style="list-style-type: none"> - The parasite drag - - profile drag - interference drag - friction drag 	X	X				
The parasite drag <ul style="list-style-type: none"> - profile drag - interference drag - friction drag 	X	X				
The profile drag and speed	X	X				
The induced drag and speed	X	X				
The total drag	X	X				
The total drag and speed	X	X				
Minimum drag	X	X				
The drag – speed graph	X	X				
The ground effect	X	X				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Effect on C_{Di}	X	X				
Effect on α crit	X	X				
Effect on C_L						
Effect on take-off and landing characteristics of an aircraft	X	X				
The relation between the lift coefficient and the speed for constant lift	X	X				
As a formula	X	X				
In a graph	X	X				
The stall	X	X				
Flow separation at increasing angles of attack <ul style="list-style-type: none"> - the boundary layer : - laminar layer - turbulent layer - transition - separation point - influence of angle of attack - influence on : - pressure distribution - location of centre of pressure - C_L - C_D - Pitch moments - Down-wash at horizontal stabilizer 	X	X				
<ul style="list-style-type: none"> - buffet - use of controls 						
The stall speed <ul style="list-style-type: none"> - in the lift formula - 1g stall speed] - FAA stall speed - Influence of : - The centre of gravity - Power setting - Altitude (IAS) - Wing loading, W/S - Load factor n : - definition - turns - forces 	X	X				
The initial stall in span-wise direction <ul style="list-style-type: none"> - influence of plan form - aerodynamic twist (wash out) - geometric twist - use of ailerons - influence of fences, vortilons, saw teeth and vortex generators 	X	X				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Stall warning <ul style="list-style-type: none"> - importance of stall warning - speed margin - buffet - stall strip - flapper switch - AOA vane - AOA probe - Stick shaker - Recovery from stall 	X	X				
Special phenomena of stall <ul style="list-style-type: none"> - the power-on stall - climbing and descending turns - swept back wings - super-or deep-stall, stick pusher - canards - T-tailed aircraft - Avoidance of spins : - Spin development - Spin recognition - Spin recovery - Ice (in stagnation point and on surface) : - Absence of stall warning - Abnormal behaviour of the stall - Stabilizer stall 	X	X				
C_{Lmax} augmentation	X	X				
Trailing edge flaps and the reasons for use in take-off and landing <ul style="list-style-type: none"> - different types of flaps : - split flap - plain flap - slotted flap - fowler flap - their influence on the $C_L - \alpha$ graph - their influence on the $C_L - C_D$ graph - flap asymmetry - influence on pitch movement 	X	X				
Leading edge devices and the reasons for use in take-off and landing <ul style="list-style-type: none"> - different types : - Krueger flaps - Variable camber flaps - Slats - Their influence on the $C_L - \alpha$ graph - Their influence on the $C_L - C_D$ graph - Slat asymmetry - Normal/automatic operation 	X	X				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Vortex generators - aerodynamic principles - advantages - disadvantages	X	X				
Means to decrease the C_L - C_D ration increasing drag	X	X				
Spoilers and the reasons for use in the different phases of flight - different functions : - flight spoilers (speedbrakes) - ground spoilers (lift dumpers) - roll spoilers - spoiler-mixer - their influence on the C_L - α graph - their influence on the C_L - C_D graph and ration	X	X				
Speedbrakes as a means of increasing drag and the reasons for use in the different phases of flight - the influence on the C_L - C_D graph and ration	X	X				
The boundary layer	X	X				
Different types - laminar - turbulent	X	X				
Their advantages and disadvantages on pressure drag and friction drag	X	X				
Special circumstances	X	X				
Ice and other contamination - ice in stagnation point - ice on the surface (frost, snow, clear ice)	X	X				
- rain - contamination of leading edge - effects on stall - effects on loss of controllability - effects on control surface moment - influence on high lift devices during take-off, landing and low speeds - affect on lift/drag ratio						
Deformation and modification of airframe, ageing aircraft	X	X				
TRANSONIC AERODYNAMICS	X					
The Mach number definition	X					
Speed of sound	X					
Influence of temperature and altitude	X					
Compressibility	X					
Normal shockwaves	X					
Mcrit and exceeding Mcrit	X					
Influence of : - Mach number - Control deflection - Angle of attack - Aerofoil thickness - Angle of sweep - Area ruling	X					

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Influence on : - $C_L - \alpha$ graph - C_{Lmax} - C_D - $C_L - C_D$	X					
Aerodynamic heating	X					
Shock stall/Mach buffet	X					
Influence on : - drag - pitch (Mach trim) : - contribution of : - movement of the centre of pressure - angle of sweep - down-wash	X					
Buffet margin, aerodynamic ceiling	X					
Means to avoid the effects of exceeding M_{crit}	X					
Vortex generators	X					
Supercritical profile - shape - influence of aerofoil shape on shockwaves - advantages of supercritical aerofoil	X					
SUPERSONIC AERODYNAMICS	X					
Oblique shockwaves	X					
Mach cone	X					
Influence of aircraft weight	X					
Expansion waves	X					
Centre of pressure	X					
Wave drag - control surface hinge moment - control surface efficiency	X					
STABILITY	X	X				
Condition of equilibrium in stable horizontal flight	X	X				
Precondition for static stability	X	X				
Sum of moments - lift and weight - drag and thrust	X	X				
Sum of forces - in horizontal plane - in vertical plane	X	X				
Methods of achieving balance	X	X				
Wing and empennage (tail and canard)	X	X				
Control surfaces	X	X				
Ballast or weight trim	X	X				
Longitudinal stability	X	X				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Basics and definitions <ul style="list-style-type: none"> - static stability, positive, neutral and negative - precondition for dynamic stability - dynamic stability, positive, neutral and negative - damping : - short period - effect high altitude on dynamic stability 	X	X				
Static stability	X	X				
Neutral point/location of neutral point <ul style="list-style-type: none"> - definition 	X	X				
Contribution of : <ul style="list-style-type: none"> - aircraft geometry - down-wash : - a.c. of the wing 	X	X				
Location of centre of gravity <ul style="list-style-type: none"> - aft limit, minimum stability margin - forward position - effects on static and dynamic stability 	X	X				
The $C_M - \alpha$ graph	X	X				
Contribution of : <ul style="list-style-type: none"> - location of centre of gravity - control deflection - major aircraft parts (wings, fuselage, tail) - configuration : - flap deflection - gear extension 	X	X				
The elevator position – speed graph (IAS)	X	X				
Contribution of : <ul style="list-style-type: none"> - location of centre of gravity - trim (trim tab) - trim (stabilizer trim) 	X	X				
The stick force speed graph (IAS)	X	X				
Contribution of : <ul style="list-style-type: none"> - location of centre of gravity - trim (trim tab) - trim (stabilizer trim) - Mach number/Mach trim - Friction in the system - Downsprung - Bob weight 	X	X				
The manoeuvring/stick force per g	X	X				
Contribution of : <ul style="list-style-type: none"> - location of centre of gravity - trim - spring - Bob Weight 	X	X				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Stick force per g and the limit load factor - category of certification	X	X				
Special circumstances - ice : - effects of flap extension - effects of stabilizer ice - rain - deformation of airframe	X	X				
Static directional stability	X	X				
Slip angle β	X	X				
Yaw moment coefficient C_N	X	X				
$C_N - \beta$ graph	X	X				
Contribution of - location of centre of gravity - angle of sweep of the wing - fuselage at high angles of attack - strakes	X	X				
- dorsal fin and angle of sweep of fin - major aircraft parts						
Static lateral stability	X	X				
Bank angle ϕ	X	X				
The roll moment coefficient C_l	X	X				
Contribution of angle of slip β	X	X				
The $C_l - \beta$ Graph	X	X				
Contribution of - angle of sweep of wing - ventral fin - location of the wing - dihedral/anhedral	X	X				
Effective lateral stability	X	X				
Dynamic lateral stability	X	X				
Effects of asymmetric propeller slipstream	X	X				
Tendency to spiral dive	X	X				
Dutch roll - causes - Mach - Yaw damper	X	X				
Effects of altitude on dynamic stability	X	X				
CONTROL	X	X				
General	X	X				
Basics, the Three Planes and Three Axis	X	X				
Camber change	X	X				
Angle of attack change	X	X				
Pitch control	X	X				
Elevator	X	X				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Down-wash effects	X	X				
Down-wash effects	X	X				
Ice on tail	X	X				
Location of centre of gravity	X	X				
Yaw control	X	X				
Pedal/Rudder ratiion changer	X	X				
Moments due to engine thrust	X	X				
- direct						
- induced						
Engine failure (n – 1)	X	X				
- rudder limitations at asymmetric thrust						
- meaning of V_{MCA} , V_{MCG}						
Roll control	X	X				
Ailerons	X	X				
- inboard ailerons						
- outboard ailerons						
- function in different phases of flight						
Spoilers	X	X				
Adverse yaw	X	X				
Means to avoid adverse yaw	X	X				
- frises ailerons						
- differential aileron deflection						
- coupling ailerons to rudder by spring						
- roll spoilers						
- effects of asymmetric propeller slip stream						
Interaction in different planes (yaw/roll)	X	X				
Limitations of asymmetric power	X	X				
Means to reduce control forces	X	X				
Aerodynamic balance	X	X				
- nose balance						
- hornbalances						
- internal balances						
- balance tab, antibalance tab						
- servo tab						
- spring tab						
Artificial	X	X				
- power assisted controls						
- fully powered controls						
- artificial feel :						
- inputs :						
- dynamic pressure q						
- stabilizer setting						
Mass balance	X	X				
Reasons to balance	X	X				
- means						
Trimming	X	X				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Reasons to trim	X	X				
Stabiliser trim/Trim rate versus IAS	X	X				
- position of centre of Gravity influence on trim/stabilizer setting for take-off						
LIMITATIONS	X	X				
Operating limitations	X	X				
- flutter						
- aileron reversal						
- gear/flap operating						
V_{MO} , V_{NO} , V_{NE}	X	X				
M_{MO}	X					
Manoeuvring envelope	X	X				
- load factor						
- accelerated stall speed						
- V_A , V_C , V_D						
- Manoeuvring limit load factor/certification category						
Contribution of :	X	X				
- mass						
- altitude						
- Mach number						
Gust envelope	X	X				
Gust load diagram	X	X				
- vertical gust speeds						
- accelerated stall speed						
- V_B , V_C , V_D						
- Gust limit load factor						
- V_{RA}						
Contribution of :	X	X				
- mass						
- altitude						
- Mach number						
PROPELLERS	X	X				
Conversion of engine torque to thrust	X	X				
Meaning of pitch	X	X				
Blade twist	X	X				
Fixed pitch and variable pitch/constant speed	X	X				
Propeller efficiency versus speed	X	X				
Effects of ice on propeller	X	X				
Engine failure or engine stop	X	X				
Windmilling drag	X	X				
- influence on yaw moment when asymmetric power						
Feathering	X	X				
- influence on glide performance						
- influence on yaw moment when asymmetric power						
Design feature for power absorption	X	X				
Aspect ratio of blade	X	X				

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Diameter of propeller	X	X				
Number of blades	X	X				
Propeller noise	X	X				
Moments and couples due to propeller operation	X	X				
Torque reaction	X	X				
Gyroscopic procession	X	X				
Asymmetric slipstream effect	X	X				
Asymmetric blade effect	X	X				
FLIGHT MECHANICS	X	X				
Forces acting on an airplane	X	X				
Straight horizontal steady flight	X	X				
Straight steady climb	X	X				
Straight steady descent	X	X				
Straight steady glide	X	X				
Steady coordinated turn	X	X				
- bank angle						
- load factor						
- turn radius						
- angular velocity						
- rate one turn						
Asymmetric thrust	X	X				
Moments about the vertical axis	X	X				
Forces on vertical fin	X	X				
Influence of bank angle	X	X				
- over banking						
- fin stall						
Influence of aircraft weight	X	X				
Influence of use ailerons	X	X				
Influence of special propeller effects on roll moments	X	X				
- propeller torque						
- propeller wash on flaps						
Influence of slip angle on roll moments	X	X				
V_{MCA}	X	X				
V_{MCL}	X	X				
V_{MCG}	X	X				
Influence of altitude	X	X				
Emergency descent	X	X				
Influence of configuration	X	X				
Influence of chosen mach number and IAS	X	X				
Typical points on polar curve	X	X				
Windshear	X	X				
PRINCIPLES OF FLIGHT – HELICOPTER					X	X
SUBSONIC AERODYNAMICS					X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Basics laws and definitions					X	X
Components of aircraft					X	X
Aircraft configuration					X	X
Units of measurement of					X	X
- length						
- area						
- volume						
- velocity						
- mass						
- pressure						
- temperature						
- density						
- force						
- power						
- energy						
Terms used to describe aerodynamic phenomena					X	X
Reference speeds					X	X
Abbreviations					X	X
Derivation of lift					X	X
Equation of continuity					X	X
Bernoulli's theorem					X	X
Streamline flow					X	X
Angle of attack					X	X
Pressure distribution about a wing (transverse and Longitudinal)					X	X
Centre of pressure					X	X
Aerofoil shape (plan and section) and its effect on lift					X	X
Lift formula					X	X
Lift/drag ratio					X	X
Drag					X	X
Profile drag					X	X
- causes						
- variation with speed						
- methods of minimizing it						
Induced drag					X	X
- causes						
- vortices						
- variation with speed						
- design factors affecting it						
Total effect of the combination of profile and induced drag					X	X
Distribution of forces – balance of couples					X	X
Lift/weight and thrust/drag couples					X	X
Necessity to achieve balance					X	X
Methods of achieving balance					X	X
Stability					X	X
Aircraft axes and planes of rotation					X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Static stability					X	X
Dynamic stability					X	X
Effects of design features on stability					X	X
Inter-action between stability in different planes					X	X
Effect of altitude/speed on stability					X	X
Roll and yaw dampers					X	X
Blade-stall					X	X
Angle of Attack					X	X
Boundary layer and reasons for stalling					X	X
Variation of lift and drag in the stall					X	X
Movement of the centre of pressure					X	X
Transonic effects on blades					X	X
Shock waves					X	X
- the reasons for their formation at subsonic speed						
- their effect on the handling and operation of the helicopter						
Limitations					X	X
Manoeuvring and gust envelope					X	X
Performance degradation					X	X
Adverse on performance due to profile contamination					X	X
- icing						
- rain						
- modification to and condition of the airframe						
HELICOPTER AERODYNAMICS					X	X
The helicopter and associated terminology					X	X
Comparison with fixed wing and autogiro					X	X
Plane of rotation					X	X
Axes of rotation					X	X
Rotor shaft axis					X	X
Tip path plane					X	X
Rotor disc					X	X
Disc loading					X	X
Blade loading					X	X
The forces diagram and associated terminology					X	X
Pitch angle					X	X
Rotational airflow					X	X
Induced airflow					X	X
Relative airflow to the blade					X	X
Angle of attack					X	X
Lift-blade					X	X
Drag-blade					X	X
Total reaction blade					X	X
Rotor thrust					X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Torque					X	X
Weight					X	X
Uniformity of rotor thrust along blade span					X	X
Blade twist					X	X
Taper						
Coning angle					X	X
Centrifugal force					X	X
Limits of rotor RPM					X	X
Centrifugal turning moments					X	X
Helicopter Controls					X	X
Collective lever					X	X
<ul style="list-style-type: none"> - collective pitch changes - relationship with rotor thrust and rotor drag 						
Cyclic stick					X	X
<ul style="list-style-type: none"> - cyclic pitch changes - rotor disc attitude - rotor thrust till 						
Yaw pedals					X	X
<ul style="list-style-type: none"> - fuselage torque - tail rotor drift - tail rotor roll - fenestron tail - tandem rotors - co axial rotors - notar 						
Rotor blade freedom of movement					X	X
Feathering					X	X
<ul style="list-style-type: none"> - the feathering hinge - pitch angle 						
Flapping					X	X
<ul style="list-style-type: none"> - the flapping hinge - alleviation of bending stresses - flapping to equality 						
Dragging					X	X
<ul style="list-style-type: none"> - the drag hinge - drag dampers - leading/lagging - periodic drag changes - blade cg (conservation of angular momentum) - hooks joint effect 						
Phases lag and advance angle					X	X
The control orbit					X	X
Pitch operating arm movement					X	X
Rate of pitch change					X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Rate of blade flapping					X	X
Resulting disc attitude					X	X
Phases lag definition					X	X
Advantage angle – definition					X	X
Vertical flight					X	X
Take off					X	X
Vertical climb					X	X
Vertical descent					X	X
Hover outside ground effect					X	X
Ground effect					X	X
Factors affecting ground cushion					X	X
Dynamic roll-over avoidance of					X	X
Forces in balance					X	X
At the hover					X	X
In forward flight					X	X
Influence of cg					X	X
Influence of rotor shaft till					X	X
Translation lift					X	X
Effect of horizontal airflow on induced flow					X	X
Variation of total flow through the disc with forward flight					X	X
The relationship between pitch angle and angle of attack					X	X
Power Requirements					X	X
Rotor profile power					X	X
Power absorption – tail rotor and ancillary equipment					X	X
Rotor profile power variation with forward speed					X	X
Induced drag					X	X
Parasite drag					X	X
Total power required					X	X
Power available					X	X
Further aerodynamics of forward flight					X	X
Transition from and to the hover					X	X
Symmetry and asymmetry of rotor thrust					X	X
Main rotor flapback					X	X
Tail rotor flapback and methods of removal					X	X
Factors affecting maximum forward speed <ul style="list-style-type: none"> - design limits of cyclic stick - airflow reversal - retreating blade stall - symptoms and recovery actions - compressibility - flow separation - shock stall - 'G' stall 					X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Inflow roll					X	X
Factors affecting cyclic stick limits					X	X
All up mass (AUM)					X	X
Density altitude					X	X
Cg position					X	X
The flare – poser flight					X	X
Thrust reversal					X	X
Effect on aircraft attitude					X	X
Increase in rotor thrust					X	X
Decrease in rotor drag					X	X
Increase in rotor RPM					X	X
Effect of deceleration					X	X
Settling with power (vortex ring)					X	X
Tip vortices					X	X
Comparison induced flow and external flow					X	X
Development					X	X
Change in relative airflow along blade span - root stall and turbulence					X	X
Blade sailing					X	X
Rotor RPM and blade rigidity					X	X
Effect of a adverse wind					X	X
Minimising the danger					X	X
Autorotation – vertical					X	X
Rate of decent airflow					X	X
Effective airflow					X	X
Relative airflow					X	X
Inflow and Inflow angle					X	X
Autorotative force					X	X
Rotor drag					X	X
Effect of mass and altitude					X	X
Control of rotor RPM with lever					X	X
Rotor RPM stability					X	X
Autorotation – forward flight					X	X
Factors affecting inflow angle					X	X
Effect of forward speed on rate of descent					X	X
Asymmetry of autorotative disc area in forward flight					X	X
Turning					X	X
The flare - rotor RPM increase from movement of autorotative section - increase in rotor thrust - reduction in rate of descent					X	X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Range and endurance					X	X
Autorotative landing					X	X
Height/velocity avoidance graph					X	X
Stability					X	X
Hover					X	X
Forward Flight					X	X
Rearward Flight					X	X
Stability aids					X	X
- stabilizers and effects of centre of gravity						
- gyro controlled stabilizer system						
- stabilizer bars						
- delta hinge effect						
Effect of lever application on attitude in translational flight					X	X
Control power					X	X
The teetering head					X	X
Fully articulated head					X	X
The rigid rotor					X	X
Effect on dynamic/static rollover					X	X
Power requirements – graphs					X	X
Maximum rate of climb speed					X	X
Operating with limited power					X	X
Best angle of climb speed					X	X
Maximum speed					X	X
Range and endurance					X	X
Overpitch					X	X
Overtorque					X	X
Turning					X	X
Comparison of piston and turbine engined helicopters					X	X
- range and endurance						
- effect of density altitude						
- effect of aircraft weight						

9. RADIOTELEPHONY

- (a). For issue of Commercial Pilot licence for aeroplanes/helicopters, pilots shall be conversant with radiotelephony procedures and phraseology as applied to VFR operations, action to be taken in case of communication failure.
- (b). i. For issue of Airline Transport Pilot licence for aeroplanes, pilots shall be conversant with radiotelephony procedures and phraseology, action to be taken in case of communication failure.
- ii. For issue of Airline Transport Pilot licence for helicopters, pilots shall be conversant with radiotelephony procedures and phraseology as applied to VFR operations, action to be taken in case of communication failure.
- (c). For issue of Instrument Ratings for aeroplanes/helicopters, pilots shall be conversant with radiotelephony procedures and phraseology as applied to aircraft operations under IFR, action to be taken in case of communication failure.

SYLLABUS

Note: The syllabus combines the theoretical knowledge syllabuses for Aeroplane and Helicopter. Column boxes marked with a cross ('x') indicate that knowledge of the relevant topic is required to be taught for the particular licence level. Column boxes marked with a bullet point (•) indicate that the sub-topic is NOT applicable to the particular licence level.

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
COMMUNICATIONS	X	X	X	X	X	X
VFR COMMUNICATION	X	X		X	X	
DEFINITIONS	X	X		X	X	
Meanings and significance of associated terms	X	X		X	X	
Air Traffic Services abbreviations	X	X		X	X	
Q-code groups commonly used RTF air-ground communications	X	X		X	X	
Categories of messages	X	X		X	X	
GENERAL OPERATING PROCEDURES	X	X		X	X	
Transmission of letters	X	X		X	X	
Transmission of numbers (including level information)	X	X		X	X	
Transmission of time	X	X		X	X	
Transmission technique	X	X		X	X	
Standard words and phrases (relevant RTF phraseology included)	X	X		X	X	
Radiotelephony call signs for aeronautical stations including use of abbreviated call signs	X	X		X	X	
Radiotelephony call signs for aircraft including use of abbreviated signs	X	X		X	X	
Transfer of communication	X	X		X	X	

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Test procedures including readability scale	X	X		X	X	
Read back and acknowledgement requirements	X	X		X	X	
Radar procedural phraseology	X	X		X	X	
RELEVANT WEATHER INFORMATION TERMS (VFR)	X	X		X	X	
Aerodrome weather	X	X		X	X	
Weather broadcast	X	X		X	X	
ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE	X	X		X	X	
DISTRESS AND URGENCY PROCEDURES	X	X		X	X	
Distress (definition-frequencies-watch of distress frequencies-distress signal-distress message)	X	X		X	X	
Urgency (definition-frequencies-urgency signal-urgency message)	X	X		X	X	
GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES	X	X		X	X	
IFR COMMUNICATIONS	X		X	X		X
DEFINITIONS	X		X	X		X
Meanings and significance of associated terms	X		X	X		X
Air Traffic Control abbreviations	X		X	X		X
Q-code groups commonly used in RTF air-ground communications	X		X	X		X
Categories of messages	X		X	X		X
GENERAL OPERATING PROCEDRES	X		X	X		X
Transmission of letters	X		X	X		X
Transmission of numbers (including level information)	X		X	X		X
Transmission of time	X		X	X		X
Transmission technique	X		X	X		X
Standard words and phrases (relevant RTF phraseology included)	X		X	X		X
Radiotelephony call signs for aeronautical stations including use of abbreviated call sings	X		X	X		X
Radiotelephony call sings for aircraft including use of abbreviated call sings	X		X	X		X
Transfer of communication	X		X	X		X
Test procedures including readability scale; establishment of RTF communication	X		X	X		X
Read back and acknowledgement requirements	X		X	X		X
Radar procedural phraseology	X		X	X		X
Level changes and reports	X		X	X		X
ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE	X		X	X		X
DISTRESS AND URGENCY PROCEDURES	X		X	X		X
PAN medical	X		X	X		X
Distress (definition – frequencies –watch of distress frequencies – distress signal – distress message)	X		X	X		X

	Aeroplane			Helicopter		
	ATPL	CPL	IR	ATPL	CPL	IR
Urgency (definition of frequencies-urgency signal – urgency message)	X		X	X		X
RELEVANT WEATHER INFORMATION TERMS (IFR)	X		X	X		X
Aerodrome weather	X		X	X		X
Weather broadcast	X		X	X		X
GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES	X		X	X		X
MORSE CODE	X	X	X	X	X	X
Range and endurance				X	X	
Overpitch				X	X	
Overtorque				X	X	
Turning				X	X	
Comparison of piston and turbine engine helicopters				X	X	
- range and endurance						
- effect of density altitude						
- effect of aircraft weight						

**PILOTS' TECHNICAL EXAMINATION SYLLABUS FOR
FIR
(AEROPLANES/HELICOPTERS)**

**PILOTS' TECHNICAL EXAMINATION SYLLABUS FOR FIR
(AEROPLANES/HELICOPTERS)**

As depicted in Rule 34(b) of CAR '84 (Part-1), an applicant, for issue Flight Instructor Rating (FIR) appropriate to aeroplanes and helicopters shall have met the knowledge requirements for the issue of a Commercial Pilot Licence as specified in rule 24 or rule 29 as appropriate, the associated syllabus outlined in this manual thereof, and in addition, the applicant shall have demonstrated a level of knowledge appropriate to the privileges granted to the holder of a Flight Instructor Rating, in at least the following areas:-

1. Techniques of applied instruction,
2. Assessment of student performance in those subjects in which ground instruction is given,
3. The learning process,
4. Elements of effective teaching,
5. Student evaluation and testing, training philosophies,
6. Training programme development,
7. Lesson planning,
8. Classroom instructional techniques,
9. Use of training aids,
10. Analysis and correction of student errors,
11. Human performance and limitations relevant to flight instruction, and
12. Hazards involved in simulating system failures and malfunctions in the aircraft;

The aim of this course is to give adequate training to the applicant in theoretical knowledge instruction.

Examination details (to be conducted by CAAB) :

Type of Question	Duration	Total Marks	Pass Marks
Theoretical Knowledge	2:00	40	70%
Teaching/Demonstrative Technique	2:00	40	
Interview	1:00	20	

SYLLABUS

1. THE LEARNING PROCESS
 - Motivation
 - Perception and understanding
 - Memory and its application
 - Habits and transfer
 - Obstacles to learning
 - Incentives to learning
 - Learning methods
 - Rates of learning

2. THE TEACHING PROCESS
 - Elements of effective teaching
 - Planning of instructional activity
 - Teaching methods
 - Use of 'lesson plans'

3. TRAINING PHILOSOPHIES
 - Value of a structured (approved) course of training
 - Importance of a planned syllabus
 - Integration of theoretical knowledge and flight instruction

4. TECHNIQUES OF APPLIED INSTRUCTION
 - a. Theoretical knowledge – Classroom instruction techniques
 - Use of training aids
 - Group lectures
 - Individual briefings
 - Student participation/discussion

 - b. FLIGHT – Airborne instruction techniques
 - The flight/cockpit environment
 - Techniques of applied instruction
 - Post-flight and in-flight judgment and decision making

5. STUDENT EVALUATION AND TESTING
 - a. Assessment of student performance
 - The function of progress tests
 - Recall of knowledge
 - Translation of knowledge into understanding
 - Development of understanding into actions
 - The need to evaluate rate of progress

 - b. Analysis of student errors
 - Establish the reason for errors
 - Tackle major faults first, minor faults second
 - Avoidance of over criticism
 - The need for clear concise communication

6. TRAINING PROGRAMME DEVELOPMENT
 - Lesson planning
 - Preparation
 - Explanation and demonstration
 - Student participation and practice
 - Evaluation

7. HUMAN PERFORMANCE AND LIMITATIONS RELEVANT TO FLIGHT INSTRUCTION
 - Physiological factors
 - Psychological factors
 - Human information processing
 - Behavioural attitudes
 - Development of judgment and decision making

8. HAZARDS INVOLVED IN SIMULATING SYSTEMS FAILURES AND MALFUNCTIONS IN THE AEROPLANE DURING FLIGHT
 - Selection of a safe altitude
 - Importance of 'touch drills'
 - Situational awareness
 - Adherence to correct procedures

9. NIGHT FLYING INSTRUCTION
 - Objectives
 - Legislation requirements
 - Aeroplane/helicopter equipment
 - Aeroplane/helicopter lights
 - Flight crew licences
 - Aerodrome licences (if applicable)
 - Night familiarization
 - Preparation for flight
 - Equipment required for flight
 - Night vision accommodation
 - Personal safety precautions in the parking areas
 - External/internal checks-night considerations
 - Aeroplane/helicopter lights – operation

10. TRAINING ADMINISTRATION
 - Flight/theoretical knowledge instruction records
 - Pilot's personal flying log book
 - The flight/ground curriculum
 - Study material
 - Official forms
 - Aircraft Flight/Owner's Manuals/Pilot's Operating Handbooks
 - Flight authorization papers
 - Aircraft documents
 - The private pilot's licence regulations

**SUGGESTED APPROXIMATE BREAKDOWN OF HOURS FOR THE THEORETICAL
KNOWLEDGE INSTRUCTION SECTION OF THE
FLIGHT INSTRUCTOR COURSE**

(The item numbers shown below relate to the item numbers of 'Teaching and learning' above)

Item No	Tuition hours	Practice hrs in class	Comment	Progress tests
1	2.00	-	Allow for questions and short discussion periods.	0.30
2	4.00	-	The tuition time should allow for questions and short discussion periods.	1.00
3	2.00	-	The PPL training syllabus should be used as reference material.	0.30
4.a.	5.00	32	The time spent in practice under this item will involve the applicants refreshing their technical knowledge, and developing their classroom instruction techniques. It will also include discussion between applicants and advice on teaching from the supervising instructor.	
4.b.	4.00	32	The time spent in practice will be mainly directed to the giving of pre-flight briefings. It will allow the applicants to develop their ability to give a practical and short briefing (10-15 minutes) to a student pilot. The briefing will outline in a logical sequence the flight lesson to be undertaken.	
5.a.	2.00	-	Emphasis should be placed on the validity of questions used in progress tests.	1.00
5.b.	2.00	-	Emphasis should be placed on the need to give encouragement to the student.	1.00
6	5.00	14	The time spent in practice will be directed towards the planning of classroom lesson periods and the development of the applicants' ability to construct lesson plans.	
7	5.00	-	Scenarios relevant to good judgement and decision making should be set and analyses.	1.00
8	2.00	-	Examples of hazards should cover a broad range of light aircraft and types of operation and not to be continued to the aircraft used on the course.	1.00
9	5.00	-	Long briefings to teach an applicant to give instruction in night flying	
10	2.00	-	General revision of relevant documents.	1.00
TOTAL	40.00	78.00		7.00
:				
COURSE TOTAL :			125 HOURS (including progress tests)	

