NYÍREGYHÁZI EGYETEM — Tantárgy: **Rg. műszerek és elektromos berend.**
Műszaki és Agrártudományi Intézet — 2025/2026. tanév II. félév
Közlekedéstudományi és Infotechnológiai Tanszék — Kód: **RS1303**

FOGLALKOZÁSI TERV

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Előadás: heti 3 óra, félévi 52 óra
Előadó: Dr. Gáti Balázs

A tantárgy kredit értéke: 3
Gyakorlat: heti 2 óra, félévi 28 óra
Gyakorlatvezető: Dr. Gáti Balázs

Számonkérés formája: kollokvium
Zárthelyi dolgozatok száma: 2
Alkalmazástechnikai feladatok száma: -

A megíratás időpontja: 7, 14. okt. hét
Beadási határidő: -

Kötelező és ajánlott szakirodalmak:

- Oxford Aviation training: Instrumentation. 2014.
- Bristol Ground School: 022 AGK - Instrumantation
- AVIATIONEXAM Intrumentation
- A http://moodle.nyf.hu/ oldalról a következő úton elérhető Kezdőoldal / ► Kurzusok / ►TÁMOP -4.1.2.D-12/1/KONV-2012-0019 (Idegen nyelvi kompetenciák fejlesztése) / ► Közlekedésmérnöki- légiközlekedési-hajózó szakirány / a „Airplane Instruments and Apparatus II.”.

A félévelismerés feltételei (címszavakban):
Foglalkozásokon a jelenlét, fegyelmezett viselkedés és aktív munkavégzés a Tanulmányi és Vizsgaszabályzat szerint.

- Mindkét zárthelyi dolgozat eredményes megírása
- Zárthelyi dolgozat I. szerezhető 50 pont
  Zárthelyi dolgozat II. szerezhető 50 pont
  Maximálisan szerezhető pontszám 100 pont

Érdemjegy	Alsó határ
2	51%
3	63%
4	75%
5	87%

Nyíregyháza, 2026. február 5.

Dr. Gáti Balázs
tantárgyfelelős

Dr. Sikolya László
tanszékvezető

Témabontás

Oktatási hét	Témakód	Téma
1. hét	022.01.01.01.01	Define ‘pressure’, ‘absolute pressure’ and ‘differential pressure’.
	022.01.01.01.02	List the following units used for pressure measurement: Pascal; bar; inches of mercury (in Hg); pounds per square inch (psi).
	022.01.01.01.03	State the relationship between the different units.
	022.01.01.01.04	List and describe the following different types of sensors used according to the pressure to be measured: aneroid capsules; bellows; diaphragms; bourdon tube.
	022.01.01.01.05	Identify pressure measurements that are applicable to an aircraft: liquid-pressure measurement (fuel, oil, hydraulic); air-pressure measurement (bleed-air systems, air-conditioning systems); engine-pressure measurement manifold pressure (MAP), engine pressure ratio (EPR)).
	022.01.01.01.06	Identify and read pressure measurement indications both for engine indications and other systems.
	022.01.01.01.07	Explain the implications of the following pressure measurement errors both for engine indications and other systems: loss of pressure sensing; incorrect pressure indications.
	022.01.02.01.01	Explain temperature.
	022.01.02.01.02	List the following units that can be used for temperature measurement: Kelvin; Celsius; Fahrenheit.
	022.01.02.01.03	State the relationship between these units and convert between them.
	022.01.02.01.04	Identify temperature measurements that are applicable to an aircraft: gas temperature measurement (ambient air, bleed-air systems, air-conditioning systems, air inlet, exhaust gas, gas turbine outlets); liquid-temperature measurement (fuel, oil, hydraulic); component-temperature measurement (generator, transformer rectifier unit (TRU), pumps (fuel, hydraulic), power transfer unit (PTU).
	022.01.02.01.05	Identify and read temperature measurement indications for both engine indications and other systems.
	022.01.03.01.01	State that the quantity of fuel can be measured by volume or mass.
	022.01.03.01.02	List the following units used for fuel quantity: kilogramme; pound; litres; gallons (US and imperial).
	022.01.03.01.03	Convert between the various units.
	022.01.03.01.04	Explain the parameters that can affect the measurement of the volume or mass of the fuel in a fuel tank: temperature; aircraft accelerations and attitudes; and explain how the fuel-gauge system design compensates for these changes.
2. hét		
	022.01.03.01.05	Describe and explain the operating principles of the following types of fuel gauges: float system; capacitance-type of fuel-gauge system. ultrasound-type of fuel-gauge system: to be introduced at a later date.
	022.01.03.01.06	Describe and complete a typical post-refuelling procedure for a pilot: recording the volume that was filled; converting to the appropriate unit used by the aircraft fuel gauge(s) to compare the actual indicated fuel content to the calculated fuel content; assess appropriate action if the numbers does not compare.
	022.01.04.01.01	Define ‘fuel flow’ and where it is measured.
	022.01.04.01.02	State that fuel flow may be measured by volume or mass per unit

		of time.
	022.01.04.01.03	List the following units used for fuel flow when measured by mass per hour: kilogrammes/hour; pounds/hour.
	022.01.04.01.04	List the following units used for fuel flow when measured by volume per hour: litres/hour; imperial gallons/hour; US gallons/hour.
	022.01.04.01.05	Explain how total fuel consumption is obtained.
	022.01.05.01.01	List the following types of tachometers, describe their basic operating principle and give examples of use: mechanical (rotating magnet); electrical (three-phase tacho-generator); electronic (impulse measurement with speed probe and phonic wheel); and describe the operating principle of each type.
	022.01.05.01.02	Explain the typical units for engine speed: rpm for piston-engine aircraft; percentage for turbine-engine aircraft.
	022.01.05.01.03	Explain that some types of rpm indicators require electrical power to provide an indication.
	022.01.06.01.01	List and describe the following two parameters used to represent thrust: N1; EPR.
	022.01.06.01.02	Explain the operating principle of using an engine with EPR indication and explain the consequences of incorrect or missing EPR to the operation of the engine, including reverting to N1 mode.
	022.01.06.01.03	Give examples of display for N1 and EPR.
	022.01.07.01.01	Define ‘torque’.
3. hét	022.01.07.01.02	Explain the relationship between power, torque and rpm.
	022.01.07.01.03	List the following units used for torque: Newton meters; inch or foot pounds.
	022.01.07.01.04	State that engine torque can be displayed as a percentage.
	022.01.07.01.05	List and describe the following different types of torquemeters, and explain their operating principles: mechanical; electronic.
	022.01.07.01.06	Compare the two systems with regard to design and weight.
	022.01.07.01.07	Give examples of display.
	022.01.08.01.01	State the purpose of a synchroscope.
	022.01.08.01.02	Explain the operating principle of a synchroscope.
	022.01.08.01.03	Give examples of display.
	022.01.09.01.01	State the purpose of a vibration-monitoring system for a jet engine.
	022.01.09.01.02	Describe the operating principle of a vibration-monitoring system using the following two types of sensors: piezoelectric crystal; magnet.
	022.01.09.01.03	Explain that there is no specific unit for vibration monitoring, i.e. it is determined by specified numeric threshold values.
	022.01.09.01.04	Give examples of display.
	022.01.10.01.01	Explain that the on-board aircraft clock provides a time reference for several of the on-board systems including aircraft communications addressing and reporting system (ACARS) and engine and systems maintenance.
	022.02.01.01.01	Define the following pressure measurements and state the relationship between them: static pressure; dynamic pressure; total pressure.
	022.02.01.02.01	Describe the design and the operating principle of a: static port/source; pitot tube; combined pitot/static probe.
4. hét	022.02.01.02.02	For each of these indicate the various locations and describe the following associated errors and how to correct, minimise the effect of or compensate for them: position errors; instrument errors; errors due to a non-longitudinal axial flow (including

		manoeuvre-induced errors).
	022.02.01.02.03	Describe a typical pitot/static system and list the possible outputs.
	022.02.01.02.04	Explain the redundancy and the interconnections that typically exist in complex pitot/static systems found in large aircraft.
	022.02.01.02.05	Explain the purpose of pitot/static system heating.
	022.02.01.02.06	Describe alternate static sources and their effects when used, particularly in unpressurised aircraft.
	022.02.01.02.07	Describe a modern pitot static system using solid-state sensors near the pitot probe or static port converting the air data to numerical data (electrical signals) before being sent to the air-data computer(s).
	022.02.02.01.01	Define the following and explain the relationship between them: outside air temperature (OAT); total air temperature (TAT); static air temperature (SAT).
	022.02.02.01.02	Explain the term ‘ram rise’ and convert TAT to SAT.
	022.02.02.01.03	Explain why TAT is often displayed and that TAT is the temperature input to the air-data computer.
	022.02.02.02.01	Indicate typical locations for both direct-reading and remote-reading temperature probes, and describe the following errors: position error; instrument error.
	022.02.02.02.02	Explain the purpose of temperature probe heating and interpret the effect of heating on sensed temperature unless automatically compensated for.
	022.02.03.01.01	Describe the following two types of AoA sensors: null-seeking (slotted) probe; vane detector.
	022.02.03.01.02	For each type, explain the operating principles.
	022.02.03.01.03	Explain how both types are protected against ice.
	022.02.03.01.04	Give examples of systems that use the AoA as an input, such as: air-data computer; stall warning systems; flight-envelope protection systems.
5. hét	022.02.03.01.05	Give examples of and interpret different types of AoA displays: simple light arrays of green, amber and red lights; gauges showing a numerical scale.
	022.02.03.01.06	Explain the implications for the pilot if the AoA indication becomes incorrect but still provides data, e.g. if the sensor is frozen in a fixed position.
	022.02.03.01.07	Explain how an incorrect AoA measurement can affect the controllability of an aircraft with flight-envelope protection.
	022.02.04.01.01	List the following two units used for altimeters and state the relationship between them: feet; metres.
	022.02.04.01.02	Define the following terms: height, altitude; indicated altitude, true altitude; pressure altitude, density altitude.
	022.02.04.01.03	Define the following barometric references: ‘QNH’, ‘QFE’, ‘1013.25’.
	022.02.04.01.04	Explain the operating principles of an altimeter.
	022.02.04.01.05	Describe and compare the following three types of altimeters and reason(s) why particular designs may be required in certain airspace: simple altimeter (single capsule); sensitive altimeter (multi-capsule); servo-assisted altimeter.
	022.02.04.01.06	Give examples of associated displays: pointer, multi-pointer, drum, vertical straight scale.
	022.02.04.01.07	Describe the following errors: static system error; instrument error; barometric error; temperature error (air column not at ISA conditions); lag (altimeter response to change of height).
	022.02.04.01.08	Demonstrate the use of an altimeter correction table for the following errors: temperature corrections; aircraft position errors.

	022.02.04.01.09	Describe the effects of a blockage or a leakage on the static pressure line.
	022.02.04.01.10	Describe the use of GPS altitude as an alternative means of checking erroneous altimeter indications, and highlight the limitations of the GPS altitude indication.
	022.02.05.01.01	List the two units used for VSIs and state the relationship between them: metres per second; feet per minute.
	022.02.05.01.02	Explain the operating principles of a VSI and an IVSI.
6. hét	022.02.05.01.03	Describe and compare the following types of VSIs: barometric type (VSI); instantaneous barometric type (IVSI); inertial type (inertial information provided by an inertial reference unit).
	022.02.05.01.04	Describe the following VSI errors: static system errors; instrument errors; time lag.
	022.02.05.01.05	Describe the effects on a VSI of a blockage or a leakage on the static pressure line.
	022.02.05.01.06	Give examples of a VSI display.
	022.02.05.01.07	Compare the indications of a VSI and an IVSI during flight in turbulence and appropriate pilot technique during manoeuvring using either type.
	022.02.06.01.01	List the following three units used for airspeed and state the relationship between them: nautical miles/hour (kt); statute miles/hour (mph); kilometres/hour (km/h).
	022.02.06.01.02	Describe the following ASI errors and state when they must be considered: pitot/static system errors; instrument errors; position errors; compressibility errors; density errors.
	022.02.06.01.03	Explain the operating principles of an ASI (as appropriate to aeroplanes or helicopters).
	022.02.06.01.04	Give examples of an ASI display: pointer, vertical straight scale, and digital (HUD display).
	022.02.06.01.05	Demonstrate the use of an ASI correction table for position error.
	022.02.06.01.06	Define and explain the following colour codes that can be used on an ASI: white arc (flap operating speed range); green arc (normal operating speed range); yellow arc (caution speed range); red line (VNE) or barber's pole (VMO); blue line (best rate of climb speed, one-engine-out for multi-engine piston light aeroplanes).
	022.02.06.01.08	Describe the effects on an ASI of a blockage or a leakage in the static or total pressure line(s).
	022.02.06.01.09	Define the term 'unreliable airspeed' and describe the means by which it can be recognised such as: different airspeed indications between ASIs; unexpected aircraft behaviour; buffeting; aircraft systems warning; aircraft attitude.
	022.02.06.01.10	Describe the appropriate procedures available to the pilot in the event of unreliable airspeed indications: combination of a pitch attitude and power setting; ambient wind noise inside the aircraft; use of GPS speed indications and the associated limitations.
	022.02.07.01.01	Define 'Mach number' and 'local speed sound' (LSS). Calculate between LSS, TAS and Mach number.
	022.02.07.01.02	Describe the operating principle of a Machmeter.
7. hét		progress test
8. hét	022.02.07.01.03	Explain why a Machmeter does not suffer from compressibility error.
	022.02.07.01.04	Give examples of a Machmeter display: pointer, drum, vertical straight scale, digital.
	022.02.07.01.05	Describe the effects on a Machmeter of a blockage or a leakage in the static or total pressure line(s).
	022.02.07.01.06	Explain the relationship between CAS, TAS and Mach number.

		Explain how CAS, TAS and Mach number vary in relation to each other during a climb, a descent, or in level flight in different temperature conditions.
	022.02.07.01.07	State the existence of maximum operating limit speed (VMO) and maximum operating Mach number (MMO).
	022.02.07.01.08	Describe typical indications of MMO and VMO on analogue and digital instruments.
	022.02.07.01.09	Describe the relationship between MMO and VMO with change in altitude and the implications of climbing at constant IAS and descending at constant Mach number with respect to the margin to MMO and VMO.
	022.02.07.01.10	Describe the implications of climbing or descending at constant Mach number or constant IAS with respect to the margin to the stall speed or maximum speed.
	022.02.08.01.01	Explain the operating principle of an ADC.
	022.02.08.01.02	List the following possible input data: TAT; static pressure; total pressure; measured temperature; AoA; flaps position; landing gear position; stored aircraft data.
	022.02.08.01.03	List the following possible output data, as applicable to aeroplanes or helicopters: IAS; TAS; SAT; TAT; Mach number; AoA; altitude; vertical speed; VMO/MMO pointer.
	022.02.08.01.04	Explain how position, instrument, compressibility and density errors can be compensated/corrected to achieve a TAS calculation.
	022.02.08.01.05	Give examples of instruments or systems which may use ADC output data.
	022.02.08.01.06	Explain that an air-data inertial reference unit (ADIRU) is an ADC integrated with an inertial reference unit (IRU), that there will be separate controls for the ADC part and inertial reference (IR) part, and that incorrect selection during failure scenarios may lead to unintended and potentially irreversible consequences.
	022.02.08.01.07	Explain the ADC architecture for air-data measurement including sensors, processing units and displays, as opposed to stand-alone air-data measurement instruments.
	022.02.08.01.08	Describe the consequences of the loss of an ADC compared to the failure of individual instruments.
9. hét	022.03.01.01.01	Describe the magnetic field of the Earth.
	022.03.01.01.02	Explain the properties of a magnet.
	022.03.01.01.03	Define the following terms: magnetic variation; magnetic dip (inclination).
	022.03.01.01.04	Describe that a magnetic compass will align itself to both the horizontal (azimuth) and vertical (dip) components of the Earth’s magnetic field, thus will not function in the vicinity of the magnetic poles.
	022.03.01.01.05	Demonstrate the use of variation values (given as East/West (E/W) or +/–) to calculate: true heading to magnetic heading; magnetic heading to true heading.
	022.03.02.01.01	Explain the following differences between permanent magnetism and electromagnetism: when they are present; what affects their magnitude.
	022.03.02.01.02	Explain the principles of and the reasons for: compass swinging (determination of initial deviations); compass compensation (correction of deviations found); compass calibration (determination of residual deviations).
	022.03.02.01.03	Explain how permanent magnetism within the aircraft structure and electromagnetism from the aircraft systems affect the accuracy of a compass.

	022.03.02.01.04	Describe the purpose and the use of a deviation correction card.
	022.03.02.01.05	Demonstrate the use of deviation values (either given as E/W or +/–) from a compass deviation card to calculate: compass heading to magnetic heading; magnetic heading to compass heading.
	022.03.03.01.01	Explain the purpose of a direct-reading magnetic compass.
	022.03.03.01.02	Describe how the direct-reading magnetic compass will only show correct indications during straight, level and unaccelerated flight, and that an error will occur during the following flight manoeuvres (no numerical examples): acceleration and deceleration; turning; during pitch-up or pitch-down manoeuvres.
	022.03.03.01.03	Explain how the use of timed turns eliminates the problem of the turning errors of a direct-reading magnetic compass, and calculate the duration of a rate-1 turn for a given change of heading.
	022.03.03.01.04	Describe the serviceability check for a direct-reading magnetic compass prior to flight, such as: the physical appearance of the device; comparing the indication to another known direction such as a different compass or runway direction.
	022.03.04.01.01	Explain the purpose of a flux valve.
	022.03.04.01.02	Explain its operating principle.
10. hét	022.03.04.01.03	Indicate typical locations of the flux valve(s).
	022.03.04.01.04	Give the remote-reading compass system as example of application for a flux valve.
	022.03.04.01.05	Explain that deviation is compensated for and, therefore, eliminates the need for a deviation correction card.
	022.03.04.01.06	Explain that a flux valve does not suffer from the same magnitude of errors as a direct-reading magnetic compass when turning, accelerating or decelerating and during pitch-up or pitch-down manoeuvres.
	022.04.01.01.01	Define a ‘gyro’.
	022.04.01.01.02	Explain the fundamentals of the theory of gyroscopic forces.
	022.04.01.01.03	Define the ‘degrees of freedom’ of a gyro. Remark: As a convention, the degrees of freedom of a gyroscope do not include its own axis of rotation (the spin axis).
	022.04.01.01.04	Explain the following terms: rigidity; precession; wander (drift/topple).
	022.04.01.01.05	Explain the three types of gyro wander: real wander; apparent wander; transport wander.
	022.04.01.01.06	Describe the two ways of driving gyroscopes and any associated indications: air/vacuum; electrically.
	022.04.02.01.01	Explain the purpose of a rate-of-turn and balance (slip) indicator.
	022.04.02.01.02	Define a ‘rate-1 turn’.
	022.04.02.01.03	Describe the indications given by a rate-of-turn indicator.
	022.04.02.01.04	Explain the relation between bank angle, rate of turn and TAS, and how bank angle becomes the limiting factor at high speed (no calculations).
	022.04.02.01.05	Explain the purpose of a balance (slip) indicator and its principle of operation.
	022.04.02.01.06	Describe the indications of a rate-of-turn and balance (slip) indicator during a balanced, slip or skid turn.
11. hét	022.04.02.01.07	Describe the indications given by a turn coordinator (or turn-and-bank indicator).
	022.04.02.01.08	Compare the indications on the rate-of-turn indicator and the turn coordinator.
	022.04.03.01.01	Explain the purpose of the attitude indicator.
	022.04.03.01.02	Identify the two types of attitude indicators: attitude indicator; attitude and director indicator (ADI).

022.04.03.01.03 State the degrees of freedom.
022.04.03.01.04 Describe the effects of the aircraft's acceleration and turns on instrument indications.
022.04.03.01.05 Describe a typical attitude display and instrument markings.
022.04.04.01.01 Explain the purpose of the directional gyroscope.
022.04.04.01.02 Identify the two types of gyro-driven direction indicators: direction indicator; horizontal situation indicator (HSI).
022.04.04.01.03 Explain how the directional gyroscope will drift over time due to the following: rotation of the Earth; aircraft manoeuvring; aircraft movement over the Earth's surface/direction of travel.
022.04.04.01.04 Describe the procedure for the pilot to align the directional gyroscope to the correct compass heading.
022.04.05.01.01 Describe the principles of operation of a remote-reading compass system.
022.04.05.01.02 Using a block diagram, list and explain the function of the following components of a remote-reading compass system: flux detection unit; gyro unit; transducers, precession amplifiers, annunciator; display unit (compass card, synchronising and set-heading knob, DG/compass/slave/free switch).
022.04.05.01.03 State the advantages and disadvantages of a remote-reading compass system compared to a direct-reading magnetic compass with regard to: design (power source, weight and volume); deviation due to aircraft magnetism; turning and acceleration errors; attitude errors; accuracy and stability of the information displayed; availability of the information for several systems (compass card, RMI, automatic flight control system (AFCS)).
022.04.06.01.01 Explain that the AHRS is a replacement for traditional gyros using solid-state technology with no moving parts and is a single unit consisting of: solid-state accelerometers; solid-state rate sensor gyroscopes; solid-state magnetometers (measurement of the Earth's magnetic field).
022.04.06.01.02 Explain that the AHRS senses rotation and acceleration for all three axes and senses the direction of the Earth's magnetic field where the indications are normally provided on electronic screens (electronic flight instrument system (EFIS)).
022.05.01.01.01 State that inertial navigation/reference systems are the main source of attitude and one of the main sources of navigational data in commercial air transport aeroplanes.

12. hét

022.05.01.01.02 State that inertial systems require no external input, except TAS, to determine aircraft attitude and navigational data.
022.05.01.01.03 State that earlier gyro mechanically stabilised platforms are (technically incorrectly but conventionally) referred to as inertial navigation systems (INSs) and more modern fixed (strap down) platforms are conventionally referred to as inertial reference systems (IRSs). INSs can be considered to be stand-alone, whereas IRSs are integrated with the FMS.
022.05.01.01.04 Explain the basic principles of inertial navigation (including double integration of measured acceleration and the necessity for north–south, east–west and vertical components to be measured/extracted).
022.05.01.01.05 Explain the necessity of applying correction for transport precession, and Earth rate precession, coriolis and gravity.
022.05.01.01.06 State that in modern aircraft fitted with inertial reference system (IRS) and flight management system (FMS), the flight management computer (FMC) position is normally derived from a mathematical analysis of IRS, global positioning system (GPS),

		and distance measuring equipment (DME) data, VHF omnidirectional radio range (VOR) and LOC.
	022.05.01.01.07	List all navigational data that can be determined by a stand-alone inertial navigation system.
	022.05.01.01.08	State that a strap-down system is fixed to the structure of the aircraft and normally consists of three laser ring gyros and three accelerometers.
	022.05.01.01.09	State the differences between a laser ring gyro and a conventional mechanical gyro.
	022.05.02.01.01	State that during the alignment process, the inertial platform is levelled (INS) or the local vertical is determined (IRS), and true north/aircraft heading is established.
	022.05.02.01.02	Explain that the aircraft must be stationary during alignment, the aircraft position is entered during the alignment phase, and that the alignment process takes around 10 to 20 minutes at mid latitudes (longer at high latitudes).
	022.05.02.01.03	State that in-flight realignment is not possible and loss of alignment leads to loss of navigational data although attitude information may still be available.
	022.05.02.01.04	Explain that the inertial navigation system (INS) platform is maintained level and north-aligned after alignment is complete and the aircraft is in motion.
	022.05.02.01.05	State that an incorrect entry of latitude may lead to a loss of alignment and is more critical than the incorrect entry of longitude.
	022.05.02.01.06	State that the positional error of a stand-alone INS varies (a typical value can be quoted as 1–2 NM/h) and is dependent on the gyro drift rate, accelerometer bias, misalignment of the platform, and computational errors.
13. hét	022.05.02.01.07	Explain that, on a modern aircraft, there is likely to be an air-data inertial reference unit (ADIRU), which is an inertial reference unit (IRU) integrated with an air-data computer (ADC).
	022.05.02.01.08	Identify examples of IRS control panels.
	022.05.02.01.09	Explain the following selections on the IRU mode selector: NAV (normal operation); ATT (attitude only).
	022.05.02.01.10	State that the majority of the IRS data can be accessed through the FMS control and display unit (CDU)/flight management and guidance system (FMGS) multifunction control and display unit (MCDU).
	022.05.02.01.11	Describe the procedure available to the pilot for assessing the performance of individual IRUs after a flight: reviewing the residual indicated ground speed when the aircraft has parked; reviewing the drift given as NM/h.
	022.06.01.01.01	Describe the following purposes of an automatic flight control system (AFCS): enhancement of flight controls; reduction of pilot workload.
	022.06.01.01.02	Define and explain the following two functions of an AFCS: aircraft control: stabilise the aircraft around its centre of gravity (CG); aircraft guidance: guidance of the aircraft’s flight path.
	022.06.01.01.03	Describe the following two automatic control principles: closed loop, where a feedback from an action or state is compared to the desired action or state; open loop, where there is no feedback loop.
	022.06.01.01.04	List the following elements of a closed-loop control system and explain their basic function: input signal; error detector; signal processor providing a measured output signal according to set

		criteria or laws; control element such as an actuator; feedback signal to error detector for comparison with input signal.
	022.06.01.01.05	Describe how a closed-loop system may enter a state of self-induced oscillation if the system overcompensates for deviations from the desired state.
	022.06.01.01.06	Explain how a state of self-induced oscillations may be detected and describe the effects of self-induced oscillations: aircraft controllability; aircraft safety; timely manual intervention as a way of mitigating loss of control; techniques that may be used to maintain positive control of the aircraft.
14. hét		progress test