COURSE DESCRIPTIONS FOR PROFESSIONAL PILOT BSC

The order of subject follows the subject list in the model curriculum.

Subject group "Basic Natural Sciences"

Mathematics I

Code: MK3MAT1A8RX17-EN

ECTS Credit Points: 8

Evaluation: mid-semester grade

Year, Semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+4

Topics:

The basic notions of linear algebra, differentiation and integration for real functions; some applications in physics.

Literature:

Compulsory:

- Thomas' Calculus, Addison Wesley (11th edition, 2005), ISBN: 0-321-24335-8
- S. Minton, Calculus Concept and Connections, McGraw Hill (2006), ISBN: 0-07111200-6

Schedule

1st week Registration week	
2nd week: Lecture: *Real numbers* Axiom system.Boundary, inf, sup, min, max. Dedekind-complete, real line. Distance, neighbourhood, interior point, accumulation point. Intervals. The sets $\mathbb{R}$, $\mathbb{R}^2$, $\mathbb{R}^3$ and their geometric interpretations. Natural numbers, integer numbers, rational numbers. *Coordinate systems* Polar	3rd week: Lecture: *Sequences of real numbers and their limit.* The notion of real sequences. Limits and operations. Some important sequences and their properties. Monotone and bounded sequences. Practice: *Vector geomety, vector algebra.* The algebra of vectors in 2 and 3 dimensions: operations, coordinate systems. The algebraic definition of the

coordinate system. Spherical- and Cylindrical coordinate systems. **Practice:** Operations of sets, Boole algebra. Logic values, logic operations, logic functions.Cartesian product, 2-tuple, n-tuple.Cardinality. Illustrations of sets on the plane and in the space.	cross product. Geometric interpretations of the scalar product and the cross product. The mixed product.
4th week: **Lecture:** *Series of real and complex numbers.* Partial sums and convergence. Absolute convergence Geometric series, criteria of convergence. (Comparison test, ratio test, root test). **Practice:** Applications: Mechanical work, moment of a force with respect to a point, moment of a force with respect to an axis.	**5th week:** **Lecture:** *Series of real functions.* The notion of series of real functions, the convergence domain, the radius of the convergence.Power series. Power series of some elementary functions. **Practice:** *Vector geomety, vector algebra.* Unit vector in the direction of a vector, projections. Geometric applications: lines and planes in the space. The area of a triangle, the volume of a tetrahedron. The distance between a point and a line, or between a point and a plane.
6th week: **Lecture:** *Approximations of real functions.* Lagrange interpolation.Linear regression. **Practice:** *The set of thee complex numbers.* Complex plane, rectangular form, trigonometric form, exponential form, operations. Application: complex impedance	**7th week:** **Lecture:** Summary, sample test **Practice:** *Sequences of real numbers.* Limits and operations. Monotone and bounded sequences, convergence and relations among them.
8th week: 1st drawing week Test 1	
9th week: **Lecture:** *Matrices.* The arithmetic of matrices, determinants and their properties: operations, the notions of symmetrical matrix, skew-symmetrical matrix, determinant, the inverse matrix. **Practice:** *Matrices.* Operations, determinants and inverses with adjoint matrices	**10th week:** **Lecture:** *Vector spaces.* The notion of linear (or vector) space, linear combinations of vectors, linearly dependent and independent systems, basis, dimension, coordinates.Ranks of vector systems, ranks of matrices **Practice:** *Vector spaces.* Linearly independent and dependent systems, bases.Ranks of vector systems, ranks of matrices

11th week: **Lecture:** *Systems of linear equations:* Gauss elimination (addition method) and Cramer's rule. Applications: Calculations for direct current using Kirchhoff's current and voltage laws. **Practice:** *Systems of linear equations:* Gauss elimination (addition method) and Cramer's rule.	**12th week:** **Lecture:** *Systems of linear equations:* by the inverse of the coefficient matrix **Practice:** *Systems of linear equations:* by the inverse of the coefficient matrix
13th week: **Lecture:** *Linear functions.* The notion of the linear function, the matrices of linear functions.Eigenvalues, eigenvectors. **Practice:** *Linear functions.* Determinations of matrices of linear transformations.Determinations of eigenvalues, eigenvectors.	**14th week:** **Lecture:** *Linear functions.* Bases transformations **Practice:** *Linear functions.* Bases transformations
15th week: 2nd drawing week Test	

Requirements

A, for a signature:

Participation at practice, according to Rules and Regulations of University of Debrecen. The correct solution of homework and submission before deadline. Solving assorted tasks.

B, for a grade:

All the tests must be written during the semester. Evaluation is according to the Rules and Regulations of University of Debrecen.

Mathematics II

Code: MK3MAT2A6RX17-EN

ECTS Credit Points: 6

Evaluation: mid-semester grade

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): Mathematics I

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+4

Topics:

Differentiation and integration of multivariable and vector-valued functions, differential equations.

Literature:

Compulsory:

- Thomas' Calculus, Addison Wesley (11th edition, 2005), ISBN 0-321-24335-8
- S. Minton, Calculus Concept and Connections, McGraw Hill (2006), ISBN 0-07111200-6
- M. D. Greenberg, Fundamentals of engineering analysis, Cambridge University Press, ISBN 978-0-521-80526-1

Schedule

1st week Registration week	
2nd week: **Lecture:** Metric, topology, sequences in $\mathbb{R}^n$. Linear functions. **Practice:** Limits of vectorsequences. Limits and continuity of multivariable functions. Linear functions. Notions of differential equations, classification of differential equations, initial value problem.	3rd week: **Lecture:** Parametric curves I. Notions of differentiation, linear approximation. Frenet-Serret frame. Some examples in physics **Practice:** Differentiation, linear approximation, tangent line. Applications: velocity, acceleration. Problems leading to differential equations. (Newton's second law, RLC, examples in economics).
4th week: **Lecture:** Parametric curves II. Curvature, torsion. Evolute, evolvent, conic sections. **Practice:** Curvature, torsion. Determinations of conic sections in parametric form. Differential equations which can be integrated on direct way. Separable differential equations.	5th week: **Lecture:** Differentiable functions of type $\mathbb{R}^n \to \mathbb{R}^m$. **Practice:** Derivatives of functions of type $\mathbb{R}^n \to \mathbb{R}^m$. First order linear differential equations (homogeneous and inhomogeneous, method of variation).
6th week: **Lecture:** Parametric surfaces. Tangent plane, linear approximation. Surfaces of revolution, ruled surfaces. **Practice:** Surfaces of revolution: ellipsoid and paraboloid in parametric form.	7th week: **Lecture:** Scalar field, gradient. Young's theorem. Directional derivative. **Practice:** The domains of functions of type $\mathbb{R}^2 \to \mathbb{R}$. Directional derivative and

Derivatives of functions of type $\mathbb{R}^2 \to \mathbb{R}^3$.The equation of the tangent plane. Determination of solutions of inhomogeneous first order linear differential equations	gradient. Higher order linear differential equations, Wronski determinant.
8th week: 1st drawing week Test 1,2	
9th week: **Lecture:** Local and global extrema. **Practice:** Local extremas of functions of type. $\mathbb{R}^2 \to \mathbb{R}$, $\mathbb{R}^3 \to \mathbb{R}$	**10th week:** **Lecture:** Vector fields. Derivatives. Divergence and curl. Potential function. **Practice:** Determination of global extremas on boundary closed sets. Solution of linear homogeneous differential equations of order two having constant coefficients.
11th week: **Lecture:** The notion of double and triple integrals on 2 and 3 dimensional intervals. The extensions of the integrals. **Practice:** Vector fields. Derivatives. Divergence and curl. Potential function. Method of undetermined coefficients.	**12th week:** **Lecture:** Integrals over general regions. *Applications: second moment of area, mass, center of gravity* **Practice:** Double and triple integrals on 2 and 3 dimensional intervals. Special second order differential equations.
13th week: **Lecture:** The arc length of curves, surface area. Line and surface integrals. The theorems of Gauss and Stokes, Green's formulae. Applications in physics. **Practice:** Integrals over general regions. Applications: second moment of area, mass, center of gravity. The theorems of Gauss and Stokes, Green's formulae. Applications in physics. The Laplace transform and its applications.	**14th week:** **Lecture:** Mahtematical softwares **Practice:** The arc length of curves, surface area. Line and surface integrals. Slope fields, numerical methods. (Euler, Runge-Kutta).
15th week: 2nd drawing week Test 3, 4	

Requirements

A, for a signature:

Participation at practice, according to Rules and Regulations of University of Debrecen. The correct solution of homework and submission before deadline. Solving assorted tasks.

B, for a grade:

All the tests must be written during the semester. Evaluation is according to the Rules and Regulations of University of Debrecen.

Mathematics Comprehensive Exam

Code: MK3MATSA00RX17-EN
ECTS Credit Points: 0
Evaluation: exam
Year, Semester: 1th year, 2nd semester
Its prerequisite(s): Mathematics I, Mathematics II at the same time
Further courses are built on it: Yes/No

Subjects of the comprehensive exam: Mathematics I and II

Statics and Strength of Materials

Code: MK3STSZG04XX17-EN
ECTS Credit Points: 6
Evaluation: mid-semester grade
Year, Semester: 1th year, 1th semester
Its prerequisite(s): -
Further courses are built on it: Yes/No
Number of teaching hours/week (lecture + practice): 2+2

Topics:

Introduction to engineering mechanics. Newton's laws of motion. Force, moment, and couples. Statics of a particle. Statics of rigid body. Planar force systems. Statics of planar structures. Internal force systems of rigid bodies. Loading of beams (cantilevers, freely supported beams, fraction lined beams). Determination of stress resultant diagrams (normal force, shear force and bending moment diagrams). Statically determined beam structures (hinged-bar systems, compound beams, truss systems). Fundamentals of Strength of Materials. Physical interpretation of strain terms. State of deformation. State of stresses. Constitutive equation (Hooke's law). Simple loadings (tension, compression, bending, torsion, shear). Sizing methods. Mohr's circle. Combined loadings (tension and bending, inclined bending, excentrical tension, tension and torsion, bending and torsion). An introduction to the finite element method.

Literature:

Compulsory:

- Russel C. Hibbeler (2006): Engineering Mechanics – Statics and Dynamics, Prentice Hall, 2006. ISBN-13 9780132215091

- Ladislav Cerny (1981): Elementary Statics and Strength of Materials, McGraw-Hill, ISBN 0070103399, 9780070103399
- László Kocsis (1988): Brief Account of the Lectures of Mechanics, Strength of Materials, BME
- Ferdinand P. Beer, E. Russel Johnston, Jr., John T. DeWolf (2006): University of Connecticut Mechanics of Materials, 4th Edition, © 2006, ISBN-13 9780073107950

Recommended:

- Stephen Timoshenko (1955): Strength of Materials: Elementary Theory and Problems, Van Nostrand
- Jacob Pieter Den Hartog (1961): Strength of Materials, Courier Dover Publications, ISBN 0486607550, 9780486607559

Schedule

1st week Registration week	
2nd week:	3rd week:
Lecture: Mathematical preliminaries (vector-, matrixalgebra). Introduction to engineering mechanics. Statics of a particle	Lecture: Statics of rigid bodies. Moments. Equilibrium state of a rigid body. Planar force systems.
Practice: Calculation the resultant of 2 and 3 dimensional force systems acting on particles.	Practice: Calculation of moments. Examples for equilibrium state of rigid bodies and for planar force systems.
4th week:	5th week:
Lecture: Statics of planar structures. Supports and reaction forces.	Lecture: Internal force systems of rigid bodies. Loading of beams.
Practice: Practical examples for the determination of the reaction forces of statically determined structures.	Practice: Practical examples for the determination of the normal force, shear force and bending moment functions of beams.
6th week:	7th week:
Lecture: Determination of stress resultant diagrams of beams.	Lecture: Statically determined beam structures.
Practice: Practical examples for the determination of the normal force, shear force and bending moment diagrams of beams.	Practice: Analysis of hinged-bar systems and truss systems. 1st test.
8th week: 1st drawing week	
9th week:	10th week:

Lecture: Fundamentals of Strength of Materials. Displacement-, strain- and stress field. Constitutive equation (Hooke's law).	**Lecture:** Simple loadings I: tension, compression and bending of prismatic beams. Fundamentals of sizing and control.
Practice: Practical examples for strain and stress calculations.	**Practice:** Practical examples for tension, compression and bending.
11th week:	**12th week:**
Lecture: Simple loadings II: torsion of prismatic beams with circular and ring cross sections. Mohr's circle. Shear.	**Lecture:** Combined loadings I: tension and bending, inclined bending, excentrical tension.
Practice: Practical examples for torsion and shear.	**Practice:** Practical examples for combined loadings.
13th week:	**14th week:**
Lecture: Combined loadings II: tension and torsion, bending and torsion. Sizing methods.	**Lecture:** The finite element method.
Practice: Practical examples for combined loadings.	**Practice:** Case studies for numerical calculation of engineering structures. **2nd test.**
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice** is compulsory. Students must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't make up a practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, being discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments to the course with them to each practice class. Active participation is evaluated by the teacher in every class. If a student's behaviour or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence because of the lack of active participation in class.

During the semester there are two tests: the 1st test in the 7th week and the 2nd test in the 14th week. Students have to sit for the tests.

B, for a grade:

The course ends in a **mid-semester grade** based on the test results.

The minimum requirement for both mid-term and end-term tests is 50%. Based on the score of the tests separately, the grade for the tests is given according to the following table:

Score=Grade

0-39 = fail (1); 40-52 = pass (2); 52-63 = satisfactory (3); 64-71 = good (4); 72-80 = excellent (5)

If the score of the sum of the two tests is below 40, the student once can take a retake test of the whole semester material.

Engineering Physics

Code: MK3MFIZA04RX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Geometrical optics, kinematics and dynamics of particles, concept of mechanical work, kinetic and potential energy, electrostatics, electric fields around conductors, transport processes, steady-state transport of electric charge, steady-state heat transfer (conduction, convection and radiation)

Literature:

Compulsory:

- Alvin Halpern: 3,000 Solved Problems in Physics, SCHAUM'S SOLVED PROBLEM SERIES (2011), ISBN-13: 978-0071763462
- Jerry S. Faughn, Raymond A. Serway, Chris Vuille, Charles A. Bennett: Serway's College Physics, Published 2005 by Brooks Cole Print, ISBN 0-534-99723-6

Schedule

1st week Registration week	
2nd week: **Lecture:** Geometrical (ray) optics. Concept of geometrical optics, law of reflection and refraction (Snell's law), Brewster's angle, Optics of prisms and lenses, imaging properties and magnification, aberrations, compound lenses.	**3rd week:** **Lecture:** Kinematics of a particle I. Description of the motion by scalar quantities: Scalar position, velocity and acceleration. Example: uniform and uniformly varying motion

Practice: Solving problems for the reflection and refraction of light beams and for the imaging of lenses and compound lenses.	**Practice:** Solving problems for uniform and uniformly varying motions.
4th week:	**5th week:**
Lecture: Kinematics of a particle II. Description of the motion by vector quantities: Position vector, vector velocity and acceleration. Example: throwing problems, circular motion. **Practice:** Solving throwing and circular motion problems.	**Lecture:** Kinetics of a particles I. Inertial frame of reference, Newton's Laws, force formulas. Application of Newton's Laws in static and dynamic problems. **Practice:** Application of Newton's laws in kinetic problems.
6th week:	**7th week:**
Lecture: Kinetics of a particles II. Concept of work and kinetic energy, work-energy theorem. Application of work-energy theorem in dynamic problems. **Practice:** Application of Newton's laws and the work energy theorem in kinetic problems.	**Lecture:** Electrostatics I. Electric field strength and flux, Gauss's law for electricity (Maxwell's first equation), potential energy in electric fields. **Practice:** Calculation of the electric field strength and its flux in the electrostatic fields of different charge arrangements.
8th week: 1st drawing week Test 1	
9th week:	**10th week:**
Lecture: Electrostatics II. Electric voltage and potential, capacitance, capacitance of planar, cylindrical and spherical capacitors, the energy of capacitors, capacitor circuits. **Practice:**Calculating the capacitance and stored energy of different types of capacitors and capacitor connections.	**Lecture:** Transport processes Concept of physical system, current intensity and source strength, extensive and intensive physical properties, conduction and convection current. Equation of balance and steady-state conduction. Thermal conductivity and conductive resistance. Conductive resistance circuits. **Practice:** Application of the equation of balance and steady-state conduction in different physical problems.
11th week:	**12th week:**
Lecture: Steady state transport of electric charge (Direct electric current). Electric current intensity, electrical conductivity and resistance, Ohm's law, electric work and power, characteristics of DC sources,	**Lecture:** Steady-state heat transfer I - Thermal conduction. Concept of heat current and thermal conduction, equation of steady-state thermal conduction, thermal conductivity and resistance, steady

Kirchhoff's circuit laws, solution of DC circuits **Practice:** Solution of DC circuits	state temperature distribution in a one dimensional wall of thermal conductivity **Practice:** Solving thermal conduction problems
13th week: **Lecture:** Steady-state heat transfer II - Thermal convection. Concept of thermal convection and heat transfer, equation of steady-state heat transfer, heat transfer coefficient and resistance, overall heat transfer coefficient and resistance **Practice:** Calculating the steady state temperature distribution in a one dimensional wall of thermal conductivity.	**14th week:** **Lecture:** Steady-state heat transfer III - Thermal radiation. Thermal radiation characteristics, concept of black body radiation, fundamental laws of thermal radiation (Planck distribution, Wien displacement law, Stefan-Boltzmann and Kirchhoff's law), gray body radiation **Practice:** Solving thermal radiation problems.
15th week: 2nd drawing week Test 2	

Requirements

A, for a signature:

Participation at lectures is compulsory. Students must attend lectures and may not miss more than three of them during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures will be recorded by the lecturer. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed lectures must be made up for at a later date, being discussed with the tutor.

Students have to write two midterm tests during the semester. The first (40 points max) in the 8th, the second (40 points max) in the 14th week. At the end of the semester everybody will get a seminar grade on the basis of the table below:

0-39 = Fail (1); 40-50 = Close fail (2); 51-60 = Improvement needed (3); 61-70 = Very good (4); 71-80 = Excellent (5)

If somebody fails then he has to write both tests in the 1st week of the exam period again. If the result is 40 points (50%) or better, then he can take an exam. If somebody has to repeat his midterm tests then his seminar grade can't be better than (2).

There will be homework from week to week. Only students who have handed in all their homework at the time of the midterm test will be allowed to write it. The problems in the midterm tests will be selected from the homework assignments.

B, for a grade:

Everybody will get an exam grade for their exam. The final grade will be the average of the seminar and exam grade. If it is for example (3.5) then the lecturer decides if it is (3) or (4).

Dynamics and Vibrations

Code: MK3MREZG04XX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): Engineering Physics, Mathematics I

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Motion of a particle:

position, velocity and acceleration and the mathematical relations between them, description of the motion of the particle in Cartesian coordinate system and Frenet-frame, Newton's laws and differential equation of the motion of the particle, theorems of kinetics, force fields, kinetic, potential and mechanical energy, constrained motion along a two or three dimensional curve

Motion of a rigid body:

description of the translational, rotational and general plane motion of a rigid body, concept and determination of the instantaneous centre of zero velocity and acceleration, rolling motion without slipping, description of the plane motion of a rigid body in a time interval, centre of mass, momentum and angular momentum, moment of inertia and its calculation, mechanical work, Newton's laws and theorem of kinetics for rigid bodies, rotating and swinging of the body about an axis, rolling without slipping

Vibrations:

Description and classification of vibratory motions and vibrating systems. Basic definitions and properties of vibratory motion. Investigation of the elements of vibrating systems: masses and inertial elements, flexible and damping elements. Investigation of the dynamic models. Two ways for the generation of motion equations: the D'Alembert's principle and the Lagrange equations of motion. Investigation and properties of the free vibrations of single DOF undamped and damped systems. Solution of the homogenous motion equation. Investigation and properties of the forced vibrations of single DOF undamped and damped systems. Basic types of forced vibrating systems. Multiple DOF systems: introduction, basic properties, natural frequencies and modes, modal transform and decoupling.

Literature:

Compulsory:

- Russel C. Hibbeler: Engineering Mechanics – Statics and Dynamics, Prentice Hall, 2006. ISBN-13 9780132215091

- Jerry Ginsberg: Engineering Dynamics, 3rd edition, Cambridge University Press, 2007. ISBN-13: 978-0521883030
- Lakshmana C. Rao, J. Lakshminarasimhan, Raju Sethuraman, Srinivasan M. Sivakumar: Engineering Mechanics: Statics and Dynamics, PHI Learning Pvt. Ltd., 2004. ISBN 8120321898, 9788120321892
- Meirovitch, Leonard: Fundamentals of Vibration, McGraw-Hill Publishing Company, 2000. ISBN 0071181741

Recommended:

- Ferdinand P. Beer, E. Russell Johnston, Jr.: University of Connecticut, Mechanics for Engineers: Statics and Dynamics (Package), 4th Edition, ©1987, ISBN-13 9780070045842
- Joseph F. Shelley: 700 solved problems in vector mechanics for engineers, Volume II: Dynamics. (SCHAUM'S SOLVED PROBLEM SERIES), McGraw-Hill, 1990. ISBN 0-07-056687-9

Schedule

1st week Registration week

2nd week:

Lecture: Kinematics of a particle

Scalar and vector position, velocity and acceleration and the mathematical relations between them. Description of the motion in Cartesian coordinate system and Frenet-frame. Special motion types: Motion with constant acceleration, circular motion.

Practice: Particle kinematics problems

3rd week:

Lecture: Kinetics of a particle I

Newton's laws and differential equation of the motion of the particle. Theorems of kinetics (impulse-momentum, work-energy and angular impulse-angular momentum theorems). Mechanical Power. Force fields (homogeneous, central and conservative). Kinetic, potential and mechanical energy.

Practice: Particle kinetics problems

4th week:

Lecture: Kinetics of a particle II

Formulas for work and potential energy in homogeneous and central force fields. Motion of the particle in gravitational and elastic spring force fields. Constrained motion along a two or three dimensional curve.

Practice: Particle kinetics problems II

5th week:

Lecture: Kinematics of a rigid body I

Basic concepts (rigid body and disc, planar, translational, rotational and general plane motion). Connections between the velocity and acceleration of the different points of a rigid body undergoing translational, rotational and general plane motion. Instantaneous centre of zero velocity and acceleration and procedure for the determination of them with calculation and construction.

Practice: Rigid body kinematics problems

6th week: Lecture: Kinematics of a rigid body II Rolling motion without slipping. Description of the plane motion of a rigid body in a time interval. Pole curves. Practice: Rigid body kinematics problems	7th week: Lecture: Kinetics of a rigid body I Basic concepts: centre of mass, momentum and angular momentum, moment of inertia and its calculation, parallel axis theorem, mechanical work. Practice: Rigid body kinetics problems
8th week: 1st drawing week	
9th week: Lecture: Kinetics of a rigid body II Newton's laws and theorem of kinetics for rigid bodies (impulse-momentum, angular impulse-angular momentum and work-energy theorems). Special motion types: Rotating and swinging about an axis, rolling without slipping. Practice: Rigid body kinetics problems	10th week: Lecture: Description and classification of vibratory motions and vibrating systems. Basic definitions and properties of vibratory motion. Investigation of the elements of vibrating systems: masses and inertial elements, flexible and damping elements. Practice: Reduction of masses. Replacement of rigid bodies by lumped masses. Reduction of springs and damping elements.
11th week: Lecture: Investigation of the dynamic models. Two ways for the generation of motion equations: the D'Alembert's principle and the Lagrange equations of motion. Practice: Generating the equations of motion for single- and multiple degrees of freedom (DOF) systems.	12th week: Lecture: Investigation and properties of the free vibrations of single DOF undamped and damped systems. Solution of the homogenous motion equation. Practice: Calculation problems related to the free vibrations of single DOF undamped and damped systems.
13th week: Lecture: Investigation and properties of the forced vibrations of single DOF undamped and damped systems. Basic types of forced vibrating systems. Practice: Calculation examples of several kinds of forced vibrations in case of single DOF undamped and damped systems.	14th week: Lecture: Multiple DOF systems: introduction, basic properties, natural frequencies and modes, modal transform and decoupling. Practice: Calculation problems related to the free and forced vibrations of multiple DOF undamped and damped systems.
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at lectures and seminars is compulsory. Students must attend lectures and seminars and may not miss more than three of them during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures and seminars will be recorded by the lecturer. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed lectures must be made up for at a later date, being discussed with the tutor.

Students have to write two midterm tests during the semester. The first (40 points max) in the 8th, the second (40 points max) in the 14th week. At the end of the semester everybody will get a seminar grade on the basis of the table below:

0-39 = Fail (1); 40-50 = Close fail (2); 51-60 = Improvement needed (3); 61-70 = Very good (4); 71-80 = Excellent (5)

If somebody fails then he has to write both tests in the 1st week of the exam period again. If the result is 40 points (50%) or better, then he can take an exam. If somebody has to repeat his midterm tests then his seminar grade can't be better than (2).

There will be homework from week to week. Only students who have handed in all their homework at the time of the midterm test will be allowed to write it. The problems in the midterm tests will be selected from the homework assignments.

B, for a grade:

Everybody will get an exam grade for their exam. The final grade will be the average of the seminar and exam grade. If it is for example (3.5) then the lecturer decides if it is (3) or (4).

Thermodynamics and Fluid Mechanics I

Code: MK3THE1R06HX17-EN

ECTS Credit Points: 6

Evaluation: exam

Year, Semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Definitions and Fundamental Ideas of Thermodynamics. Changing the State of a System with Heat and Work. Zeroth Law of Thermodynamics. The isotherm, isochor, isobar, adiabatic and polytrophic process. The First Law of Thermodynamics: Conservation of

Energy. Corollaries of the First Law. Generalized Representation of Thermodynamic Cycles. The Carnot Cycle. Entropy. The second law of Thermodynamics. Reversibility and Irreversibility in Natural Processes. Technical work. Enthalpy. Exergy. Mixtures: Partial pressure, Dalton's laws. Gas mixtures. Gas mixtures. Real gases. Steam. Humid air. T-s diagram. Energy cycles.

Heat transfer. Basic forms of heat transfer. Fundamental equations. General differential equation of heat conduction. Steady state and transient conduction. Thermal resistance. Conduction (plane walls, cylindrical walls, spherical walls). Convection: concepts and basic relations, boundary layers, similarity concept. Free convection, forced convection (the Reynolds, Grasshof, Prandtl, Nusselt numbers).

Literature:

Compulsory:

- Lakatos Á. Basics of Heat Transfer and Fluid Mechanics. 2014, Terc Kft.
- Robert Balmer (2006) Thermo-dynamics, Jaico Publishing House, ISBN: 817224262X, 868 pages
- James R. Ogden (1998) Thermodynamics Problem Solver, Research and Education Association, ISBN: 0878915559, 1104 pages.
- Warren M. Rohsenow, James P. Hartnett, Young I. Cho (1998), Handbook of Heat Transfer, McGraw-Hill New York, ISBN: 0070535558 / 9780070535558, 1344 pages.

Schedule

1st week Registration week	
2nd week: **Lecture:** Definitions and Fundamental Ideas of Thermodynamics. Changing the State of a System with Heat and Work. Zeroth Law of Thermodynamics **Practice:** Solving problems in the theme of the lecture	**3rd week:** **Lecture:** The isotherm, isochor, isobar, adiabatic and polytrophic process. The First Law of Thermodynamics: Conservation of Energy **Practice:** Solving problems in the theme of the lecture
4th week: **Lecture**: Corollaries of the First Law. Generalized Representation of Thermodynamic Cycles. **Practice:** Solving problems in the theme of the lecture	**5th week:** **Lecture:** The Carnot Cycle. Entropy. The second law of Thermodynamics. **Practice:** Solving problems in the theme of the lecture

6th week: **Lecture:** Reversibility and and Irreversibility in Natural Processes. Technical work. Enthalpy. Exergy. **Practice:** Solving problems in the theme of the lecture	7th week: **Lecture:** Mixtures: Partial pressure, Dalton's laws. Gas mixtures. Gas mixtures. Real gases. **Practice:** Solving problems in the theme of the lecture
8th week: 1st drawing week	
9th week: **Lecture:** Steam. Humid air. T-s diagram. **Practice:** Solving problems in the theme of the lecture	10th week: **Lecture:** Energy cycles. Carnot's Cycle, Joule' s cycle. **Practice:** Solving problems in the theme of the lecture
11th week: **Lecture:** Heat transfer. Basic forms of heat transfer **Practice:** Solving problems in the theme of the lecture threaded joints in section and on view.	12th week: **Lecture**: Fundamental equations. General differential equation of heat conduction. Steady state and transient conduction. **Practice:** Solving problems in the theme of the lecture
13th week: **Lecture:** Thermal resistance. Conduction (plane walls, cylindrical walls, spherical walls). Convection: concepts and basic relations, boundary layers, similarity concept. **Practice:** Solving problems in the theme of the lecture	14th week: **Lecture:** Free convection, forced convection (the Reynolds, Grasshof, Prandtl, Nusselt numbers). **Practice:** Solving problems in the theme of the lecture
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance on the lectures is recommended, but not compulsory.

Participation at practice is compulsory. Student must attend the practices and my not miss more than three practice during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. Student can't make up a practice with another group. The attendance on practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, to be discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course with them to each practice. Active participation is evaluated by the teacher in every class. If student's behavior or conduct doesn't meet the

requirements of active participation, the teacher may evaluate their participation as an absence due to the lack of active participation in class.

During the semester there are two tests: the mid-term test is in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for grade:

The course ends with exam grade. Based on the average of the test results x 0.3 + the exam grade from the theory x 076 the mid-semester grade is calculated as an average of them:

The minimum requirement for the mid-term, end-term tests and for the exam is 50%. Based on the score of the tests separately, the grade for the tests is given according to the following table:

Score / Grade

0-50 = fail (1); 51-60 = pass (2); 61-74 = satisfactory (3); 75-89 = good (4); 90-100 = excellent (5);

Thermodynamics and Fluid Mechanics II

Code: MK3THE2R04HX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): Thermodynamics and Fluid Mechanics I

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Introduce concepts, principles, laws, observations, and models of fluids at rest and in motion. Provide basis for understanding fluid behavior and for engineering design and control of fluid systems. Develop competence with mass, energy and momentum balances for determining resultant interactions of flows and engineered and natural systems. Develop basis for correlating experimental data, designing tests, and using scale models of fluid flows. Learn nature of rotation, circulation, resistance (viscous, turbulent), boundary layers, and separation with applications to drag and lift on objects. Learn methods for computing headlosses and flows in simple pipes and channels.

Literature:

Compulsory:

- Lakatos Á. Basics of Heat Transfer and Fluid Mechanics. 2014, Terc Kft.

- Bruce R. Munson, Donald F. Young, Theodore H. Okiishi, (2009) Fundamentals of Fluid Mechanics, John Wiley and Sons, ISBN 978-0470262849, 776 pages
- Robert W. Fox, Alan T. McDonald, Robert W Fox, (1998) John Wiley and Sons, ISBN 978-0471124641, 762 pages
- Shashi Menon (2004) Piping Calculations Manual, ISBN 978-0071440905 666 pages

Schedule

1st week Registration week	
2nd week: Introduce concepts, principles, laws, observations, and models of fluids at rest and in motion Lecture: Provide basis for understanding fluid behavior and for engineering design and control of fluid systems. Practice: Solving problems in the theme of the lecture	3rd week: Lecture: Develop competence with mass balances for determining resultant interactions of flows and engineered and natural systems. Practice: Solving problems in the theme of the lecture
4th week: Lecture: Develop competence with energy balances for determining resultant interactions of flows and engineered and natural systems. Practice: Solving problems in the theme of the lecture	5th week: Lecture: Develop competence with momentum balances for determining resultant interactions of flows and engineered and natural systems. Practice: Solving problems in the theme of the lecture
6th week: Lecture: Develop basis for correlating experimental data, designing tests, and using scale models of fluid flows. Practice: Solving problems in the theme of the lecture	7th week: Lecture, practice: Solving problems in the theme of the lecture
8th week: 1st drawing week	
9th week: Lecture: Learn nature of rotation, circulation, resistance (viscous, turbulent), boundary layers, and separation with applications to drag and lift on objects. Practice: Solving problems in the theme of the lecture	10th week: Lecture: Learn methods for computing headlosses and flows in simple pipes and channels. Practice: Solving problems in the theme of the lecture
11th week: Lecture: Navier- Stokes equation	12th week: Lecture: Losses in pipes.

Practice: Solving problems in the theme of the lecture.	**Practice:** Solving problems in the theme of the lecture
13th week:	**14th week:**
Lecture: Bernoulli equation.	**Lecture:** Law of impulse and momentoum.
Practice: Solving problems in the theme of the lecture	**Practice:** Solving problems in the theme of the lecture
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance on the lectures is recommended, but not compulsory.

Participation at practice is compulsory. Student must attend the practices and my not miss more than three practice during the semester. In case a student misses more than three, the subject will not be signed and the student must repeat the course. Student can't make up a practice with another group. The attendance on practice will be recorded by the practice leader. Being late is counted as an absence. In case of further absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date, to be discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments for the course with them to each practice. Active participation is evaluated by the teacher in every class. If student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate their participation as an absence due to the lack of active participation in class.

During the semester there are two tests: the mid-term test is in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for grade:

The course ends with exam grade. Based on the average of the test results x 0.3 + the exam grade from the theory x 076 the mid-semester grade is calculated as an average of them:

The minimum requirement for the mid-term, end-term tests and for the exam is 50%. Based on the score of the tests separately, the grade for the tests is given according to the following table:

Score / Grade

0-50 = fail (1); 51-60 = pass (2); 61-74 = satisfactory (3); 75-89 = good (4); 90-100 = excellent (5);

Electrotechnics and Electronics

Code: MK3ELTER06RX17-EN

ECTS Credit Points: 6

Evaluation: mid-semester grade

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): Mathematics I, Engineering Physics

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Introduction to DC circuits: voltage, current, basic components. Network analysis: Ohm's Law, Kirchhoff's Law, current and voltage divider, superposition, Thevenin and Norton's Law. Alternating current circuits: sinusoidal wave, calculation on the complex plane, power and effective values. Transient signals in the AC circuits: series and parallel RLC circuits. 3 phases circuit.

Introduction to electronics: features of electronic circuits, solid state devices. Transistors, unipolar and bipolar transistors. Operation, characteristics, and basic circuits. Amplifiers: 4 port theory, transfer functions, feedback: positive and negative. Semiconductors, diode, special diode. Common emitter amplifier. Differential amplifier: operational modes, circuit. Class A and AB amplifiers. Power amplifiers. Operational amplifiers: inverting and non-inverting type. Filters: Low and high pass filter, band pass filter.

Literature:

Compulsory:

- Electronic Circuits: Handbook for Design and Application, U. Tietze, Ch. Schenk, 2nd edition, 2008, ISBN-10: 3540004297

Schedule

1st week Registration week	
2nd week: **Lecture:** Electrostatics, DC networks: basic electrical concepts of electric charge, electric current (amperage), electric field, electric field work, electric voltage (potential), electric circuit **Practice:** General description, laboratory regulations, Safety regulations and safety instruction	3rd week: **Lecture:** Power source (ideal real), Power Source (ideal for real), Consumer, Ohm's Law, Resistance - design, characteristic data, division, marking according to IEC standard. Passive resistance of bipolar networks, Star-delta, delta-star conversion, Electrical work, electric power, efficiency **Practice:** introduction to measurements and instrumentation (measuring error, power supply, digital multimeter, signal generator)

4th week: **Lecture:** Network analysis: Kirchhoff's laws, Voltage divider, potentiometer, extending measuring range of a Volt meter current divider, extending measuring range of an Amp meter, Wheatstone bridge. Nodal analysis, Mesh analysis. **Practice:** 1st measurement: measuring the characteristics of DC voltage (U, I, RB, P) using Ohm's Law. Measuring the values of DC circuit. Using Kirchhoff's lows. Report writing.	5th week: **Lecture:** Network analysis: superposition theory, Northon and Thevenin theory. **Practice:** Perform a complex DC measurement and calculation task. Report writing.
6th week: **Lecture:** AC circuit, complex number, AC circuit mean value (RMS). Behavior of a resistance in AC circuit, inductance behavior in AC circuit, capacitance behavior in AC circuit. **Practice:** introduction to AC measurements and instrumentation (AC type digital multimeter, signal generator, oscilloscope, LRC meter). Report writing.	7th week: **Lecture:** Performance of AC circuits, power factor correction, Three-phase systems **Practice:** measurements of AC power. Report writing.
8th week: 1st drawing week	
9th week: **Lecture:** Pure and doped semiconductor characteristics, PN junction behavior at forward and reverse bias conditions. **Practice:** Silicon diode opening and closing characteristics measurements. Analysis of rectifier circuits. Report writing.	10th week: **Lecture:** Characteristics and applications of semiconductor diodes, the rectifier circuit operation, the one-way, two-way rectifier circuits operation. **Practice:** Analysis of rectifier circuits. Report writing.
11th week: **Lecture:** Bipolar transistor structure, gain, transistor parameters and characteristics, the FE connection, adjusting the set point. Areas of application of bipolar transistor, circuits transistor basic (CB, CC circuits), **Practice:** Analysis of common emitter basic circuit. Report writing.	12th week: **Lecture:** Principles of operation of field-effect transistors. **Practice:** Analysis of common source basic circuit. Report writing.
13th week: **Lecture:** Operation and characteristics of basic operational amplifier circuits	14th week: **Lecture:** Filters: Low and high pass filter, band pass filter.

(inverting, non-inverting, follower, summing, differential, differentiator and integrator basic circuit) **Practice:** Analysis of summing operational amplifier basic circuit. Report writing.	**Practice:** Analysis of filters basic circuit. Report writing.
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory. Participation at practice classes is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up a practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. Missed practice classes must be made up for at a later date, being discussed with the tutor. Active participation is evaluated by the teacher in every class. If student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as absence because of the lack of active participation in class. During the semester there are one test. Students have to sit for these tests.

Preparing measurement reports until deadline.

B, for grade:

At the end of the course a test must be taken. The minimum requirement for end-term test is 41%. Score Grade 0-40 fail (1) 41-55 pass (2) 56-70 satisfactory (3) 71-85 good (4) 86-100 excellent (5)

Subject group "Economics and Humanities"

Economics for Engineers

Code: MK3KOZMM04XX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 1st year, 1th semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+0

Topics:

Measuring Economic Output and National Income. The Keynesian Theory of consumption. The Government and Fiscal policy. Open Economy. Money market. The aggregate demand and aggregate supply. The labour market. Unemployment. Inflation.

Literature:

Compulsory:

- Mankiw, Gregory: Principles of Economics. Fifth Edition. South-Western, Mason, USA, 2009. ISBN: 9780324589979.
- Mankiw, Gregory (2015): Principles of Economics. Study Guide. Seventh Edition. Cengage Learning, ISBN-13:978-1-285-86421-1.
- Judit T. Kiss (2014): Introduction to Macroeconomics for Engineers and Technical Managers. Debrecen University Press. ISBN: 978-963-318-416-5.

Recommended:

- K. E. Case – R. C. Fair – S. M. Oster (2012): Principles of Macroeconomics, Tenth Edition. Prentice Hall, ISBN 13: 978-0-13-139140-6.
- Samuelson P.A., Nordhaus W.D.: Economics, 18th edition, Academic Internet Publishers Inc., 2006. ISBN: 0072872055
- Parkin, M., Powell, M. & Matthews, K. (2008) Economics. 7th ed. Harlow: AddisonWesley. ISBN-13: 9780132041225
- Parkin, M (2005) Economics, 7th edn, Addision Wersley: Pearson. ISBN: 0321248449.

Schedule

1st week Registration week	
2nd week: **Lecture:** The Scope and Method of Economics Introduction to economics. The method of economics. Microeconomics and Macroeconomics. Models in Economics. Introduction to Macroeconomics. The components of the Macroeconomics. The circular flow Diagram. Market sectors. Calculation/team problems: The circular flow Diagram. Case study examination.	3rd week: **Lecture:** Measuring national output and national income (Gross Output, Gross Domestic Product, calculating GDP, real versus nominal GDP, the components of the GDP, the expenditure approach, the income approach, GDP deflator, Gross National Income, and Gross National Disposable income). Measuring the cost of living (GDP and Social Welfare, the Consumer Price Index, GDP deflator versus CPI, real and nominal interest rate). Calculation/team problems: The expenditure approach. The difference between real GDP and nominal GDP. Macroeconomic indicators.

4th week:	**5th week:**
Lecture: Market demand and supply, equilibrium. The Keynesian Theory of consumption, consumption function, marginal propensity to consume, planned investment, saving function, marginal propensity to saving, aggregate output, determination of equilibrium output, the multiplier, IS curve. Calculation/team problems: Market demand and supply, equilibrium. Two sector model.	**Lecture:** The government and fiscal policy. Government purchases, taxes, disposable income, government budget deficit and surpluses, determination of equilibrium output, fiscal policy, the government spending multiplier, the tax multiplier. Average tax rate, tax wedge, and marginal tax rate. Calculation/team problems: Fiscal policy and the equilibrium. Average tax rate, tax wedge, and marginal tax rate.
6th week:	**7th week:**
Lecture: Demand and supply in an open economy. Equilibrium output in an Open Economy, net exports. Imports and exports and Trade Feedback effect. Measurement of openness. Exchange rates. Calculation/team problems: Demand and supply in an open economy. Equilibrium output in an Open Economy, net exports.	**Lecture:** The meaning of money, the functions of money, measuring the supply of money. The creation of money, required reserve ratio. The money multiplier. Open market operations. Fisher effect (nominal and real interest rate). Banking system, Commercial banking. Calculation/team problems: The money multiplier. Fisher effect (nominal and real interest rate).
8th week: 1st drawing week	Mid-Term Test I
9th week:	**10th week:**
Lecture: The demand for money. Supply and demand in the money market. The equilibrium interest rate. The LM curve. The equilibrium price-level.	**Lecture:** Aggregate demand curve and aggregate supply curve. The effects of a shift in aggregate demand, the Equilibrium. The IS-LM model. Fiscal and monetary policy. Calculation/team problems: The demand for money. Supply and demand in the money market. The equilibrium interest rate.
11th week:	**12th week:**
Lecture: The demand for labour, the supply of labour. The labour force, working-age population, active and inactive population, labour participation rate. Supply curve and demand curve, equilibrium. Calculation/team problems: Examination of the fiscal and monetary policy.	**Lecture:** Unemployment, the unemployment rate, the activity rate. Types of unemployment (voluntarily and involuntarily unemployment; structural, frictional and cyclical unemployment), Okun law. Social and economic effect.

	Calculation/team problems: The labour force, working-age population, active and inactive population, labour participation rate.
13th week: **Lecture:** Inflation; (Price level, inflation rate, definition and measuring of inflation, types and causes of inflation, demand-pull inflation and cost-push inflation, The Philips curve: unemployment rate and inflation rate). Calculation/team problems: Supply curve and demand curve, equilibrium. Disequilibrium in the labour market.	14th week: **Lecture:** Growth (sources of economic growth, human capital, education and skills), Economic growth around the World. Sustainable development. Calculation/team problems: demand-pull inflation and cost-push inflation.
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at practice classes is compulsory. Students must attend practice classes and may not miss more than three occasions during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed practice classes must be made up for at a later date, being discussed with the tutor.

During the semester there are two tests: the mid-term test on the 7th week and the end-term test on the 15th week. Students must sit for the tests.

B, for a grade:

The minimum requirement of the mid-term, the end-term test and the teamwork is 50% separately. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

The grade is given according to the following table:

0-49 %= fail (1); 50-62 % = pass (2); 63-75 % = satisfactory (3); 76-89 % = good (4); 90-100 % = excellent (5)

If the score of any test is below 50%, the student once can take a retake test of the whole semester material.

Microeconomics and Economical Processes of Enterprises

Code: MK3MIKVM04XX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 3rd year, 1st semester

Its prerequisite(s): Economics for Engineers

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 1+2

Topics:

Basic concepts of Economics and Microeconomics. Consumers Preferences and the Concept of Utility. Consumer's demand, types of elasticity of demand. Examination of Firm Behaviour. Production and cost theory. Perfectly competitive markets. Imperfect competition and market structures. Strategic behaviour at the market.

Literature:

Compulsory:

- Besanko, David – Breautigam, Ronald R. (2014): Microeconomics. Fifth Edition (International Student version). John Wiley and Sons, Inc., New York. ISBN: 978-1-118-71638-0
- Besanko, David – Breautigam, Ronald R.: Microeconomics. Study Guide. Third Edition. John Wiley and Sons, Inc., New York, 2008.
- Judit T. Kiss (2015): Introduction to Microeconomics for Engineers and Technical Managers. Debrecen University Press. ISBN: 978-963-318-469-1.
- or
- N. Gregory Mankiw – Mark P. Taylor (2011): Microeconomics, 2nd edition. South-Western Cenagage Lerrning.
- Gregory Mankiw (2006): Principles of Microeconomics - Study Guide. South-Western College Pub.
- Nellis, J. G. – Parker, D. (2006): Principles of Business Economics. Pearson Education, 2006. 2nd edition. ISBN: 0273693069, 9780273693062.

Recommended:

- Samuelson P.A., Nordhaus W.D.: Economics, 18th edition, Academic Internet Publishers Inc., 2006. ISBN: 0072872055
- Parkin, M., Powell, M. & Matthews, K. (2008) Economics. 7th ed. Harlow: Addison Wesley. ISBN-13: 9780132041225

Schedule

1st week Registration week	
2nd week: **Lecture:** Microeconomics and Macroeconomics, models in Economics. Resources. Key analytical tools. Efficiency. Market mechanism, Demand and supply analysis. Demand curves, Supply curves; shift in demand and supply. **Practice:** Calculation/team problems: equilibrium price and quantity; market demand and individual demand; shifts versus movements along the demand curve (supply curve); market supply and individual supply; shifts versus movements along the supply curve.	**3rd week:** **Lecture:** Consumer theory, consumer preferences, Utility theory. Cardinal ranking. Total utility, marginal utility. Principle of diminishing marginal utility. Utility and demand. Individual and market demand functions. Consumer surplus. Condition of optimal choice. **Practice:** Calculation/team problems: Relationship between utility and demand. Individual and market demand functions. Consumer surplus
4th week: **Lecture:** Demand and supply together, market equilibrium. The elasticity of demand (price elasticity of demand, cross price elasticity of demand, income elasticity of demand). The elasticity of supply. Total revenue and the price elasticity of demand. Application of elasticity of demand. Energy and price elasticity. Types of goods (substitutes, complements, independents). **Practice:** Calculation/team problems: Calculation of elasticity of demand, relationship between price elasticity of demand and total revenue.	**5th week:** **Lecture:** Business organizational structures. Business objectives. Types of corporation, forms of business. Market environment (domestic, international environment, markets of products, services and labour). Models of the firm's pricing decisions, costs estimation and decision. Sources of Cost efficiency. Business performance, business strategy. **Practice:** Calculation/team problems and case study examination: Firm's pricing decisions, costs estimation and decision. Sources of Cost efficiency.
6th week: **Lecture:** Production. Inputs and production function. Total product function. Marginal product of labour and average product of labour. **Practice:** Calculation/team problems: Average product of labour (capital), marginal product of labour (capital), relationship between marginal product and average product.	**7th week:** **Lecture:** Costs of production. (Total, fixed and variable costs, marginal and variable cost). The relationship between marginal and average cost. Total revenue, total profit curves. Calculating problems (types of cost, relationship between cost and profit. opportunity cost). **Practice:** Calculation/team problems: Total, fixed and variable costs; marginal and average costs. The relationship between marginal cost and average cost.

8th week: 1st drawing week	
9th week: **Lecture:** Main characteristics of perfect competition, marginal cost, average costs of production, profit-maximizing output, shut down and breakeven point, the competitive firm's supply curve. Calculating problems (marginal average, total revenue, average and marginal profit, profit-maximizing output, marginal cost curve and supply curve). **Practice:** Mid-Term Test I	**10th week:** **Lecture:** Individual and market supply curve, main condition of the profit maximization and cost minimization, Cost-benefit analysis, economical examinations. **Practice:** Calculation/team problems: Profit maximization condition for competitive market.
11th week: **Lecture:** Why Monopoly arise, Monopoly (the profit-maximization condition; average revenue, marginal revenue, total revenue curves). Problems (calculation of the profit-maximization output and price. Relationship between marginal revenue and linear demand curve). **Practice:** Calculation/team problems: Profit maximization condition for monopoly.	**12th week:** **Lecture:** *Capturing surplus – Price discrimination* First-degree price discrimination, second-degree price discrimination and third- degree price discrimination. Consumer surplus, producer surplus, deadweight loss. The welfare cost of Monopoly. **Practice:** Calculation/team problems: Monopoly versus perfect competition. Producer surplus and deadweight loss.
13th week: **Lecture:** Main characteristics of oligopoly and monopolistic competition. Markets with a few sellers, product differentiation. **Practice:** Calculation/team problems: Oligopoly market behaviour.	**14th week:** **Lecture:** *The markets for the factors of production*. Taxes and efficiency. Earnings and discrimination. Game theory. **Practice:** Calculation/team problems: Monopoly, Oligopoly and perfect competition. Taxes and efficiency.
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at practice classes is compulsory. Students must attend practice classes and may not miss more than three occasions during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed practice classes must be made up for at a later date, being discussed with the tutor.

During the semester there are two tests: the mid-term test on the 7th week and the end-term test on the 15th week. Students must sit for the tests.

B, for a grade (ESE):

The minimum requirement of the mid-term, the end-term test and the teamwork is 50% separately. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

The grade is given according to the following table:

0-49 % = fail (1); 50-62 % = pass (2); 63-75 % = satisfactory (3); 76-89 % = good (4); 90-100 % = excellent (5)

If the score of any test is below 50%, the student once can take a retake test of the whole semester material.

Quality and Technical Management

Code: MK3MINMM04XX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 3rd year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 1+2

Topics:

The aim of the course is to provide students with a comprehensive picture of the organization's operations and the associated management and organizational roles and tasks. The aim of the course is to give students the opportunity to share with the company's quality management techniques, the application of which in the European Union, as well as in Hungary, is an essential element of market competitiveness.

Literature:

Compulsory:

- Nick Milton, Patrick Lambe: The Knowledge Manager's Handbook, Kogen Page, London, 2016
- Ranulfo P. Payos, Ernesto G. Espinosa, Orlando S. Zorilla: Organization and Management, K12, 2016
- Ramani S: Improving Business Performance: A Project Portfolio Management Approach, CRC Press, 2016

Schedule

1st week Registration week	
2nd week: Lecture: Basics of Quality management Practice: Analyze examples	3rd week: Lecture: The role of quality management in the industry Practice: PDCA project
4th week: Lecture: Process Management Practice: Create a flowchart	5th week: Lecture: Quality Planning Practice: Developing a Quality Plan
6th week: Lecture: Quality Management Methods I Practice: Ishikawa, Pareto Analysis, 5W	7th week: Lecture: Quality Management Methods II Practice: QFD, Kano model, 5s, 8D report
8th week: 1st drawing week	
9th week: Lecture: Engineering management Practice: Case study	10th week: Lecture: Company and its surroundings Practice: SWOT, Pestle analyzes
11th week: Lecture: Management functions, manager roles, tasks Practice: Situational tasks	12th week: Lecture: Organization Theory Practice: Process Development, Project Management
13th week: Lecture: Human Resource Management Practice: Recruitment, selection, work planning	14th week: Lecture: Innovation Management Practice: Business Plan
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at lectures is compulsory. Students must attend lectures and may not miss more than three of them during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Attendance at lectures will be recorded by the lecturer. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed lectures must be made up for at a later date, being discussed with the tutor.

Students have to write two midterm tests during the semester. The first (40 points max) in the 8th, the second (40 points max) in the 14th week. At the end of the semester everybody will get a seminar grade on the basis of the table below:

0-39 = Fail (1); 40-50 = Close fail (2); 51-60 = Improvement needed (3); 61-70 = Very good (4); 71-80 = Excellent (5)

If somebody fails then he has to write both tests in the 1st week of the exam period again. If the result is 40 points (50%) or better, then he can take an exam. If somebody has to repeat his midterm tests then his seminar grade can't be better than (2).

There will be homework from week to week. Only students who have handed in all their homework at the time of the midterm test will be allowed to write it. The problems in the midterm tests will be selected from the homework assignments.

B, for a grade:

Everybody will get an exam grade for their exam. The final grade will be the average of the seminar and exam grade. If it is for example (3.5) then the lecturer decides if it is (3) or (4).

Environmental Protection and Dangerous Goods

Code: MK3EPDGK04RX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 3rd year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+2

Topics:

According to the environment protection part of subject the most important topics of environmental protection are introduced to the students. It includes the general knowledges and global issues of environmental protection and managements: air quality, water protection, soil protection, noise protection, and waste management side topics.

The environmental issues of air transport. Environmental policies of International Civil Aviation Organization (ICAO) and International Air Transport Association (IATA). IATA goals to assist airlines in improving their environmental performance: alternative fuels, carbon offset program, environmental assessment, fuel and emission data, cargo sustainability.

Dangerous goods: It involves the basics of safety and transportation of dangerous goods (basics of dangerous goods, hazard and handling labels, etc.) ICAO Dangerous Panel and Dangerous Goods Regulations (DGR) of IATA: global reference for shipping dangerous goods by air, shipment features and documentation.

Literature:

Recommended:

- Gilbert M. Masters, Wendell P. Ela: Introduction to Environmental Engineering and Science, Pearson New International Edition, 3/E, Pearson, 2013, ISBN:9781292025759
- Jerry A. Nathanson, Richard A. Schneider: Basic Environmental Technology, Pearson, 2015, ISBN:978-0-13-284014-9
- ICAO, IATA standards, manuals, and guidelines

Schedule

1st week Registration week	
2nd week: Basics of Environmental Protection and Environmental Management Practice: Introduction to environmental protection; Global issues on environmental protection, the environmental issues of air transport	3rd week: Air Quality and Air Quality Control Practice: Basics of air pollution control, processes in the atmosphere, greenhouse gases, ozone layer, smog, acid rain
4th week: Water and Soil Protection Practice:Water protection and quality, pollutants Protection of soil quality	5th week: Environmental Noise, Waste Management Practice: The basics of environmental noise, measuring devices and techniques Waste management, possibilities, disposal, techniques and hazardous waste
6th week: The environmental issues of air transport Practice: Environmental policies of International Civil Aviation Organization (ICAO).	7th week: The environmental issues of air transport Practice: Environmental policies of International Air Transport Association (IATA)
8th week: 1st drawing week	
9th week: Air transport safety and security Practice: Main goals of air transport safety and security	10th week: Transportation of dangerous goods Practice: Transportation of dangerous goods (basics of dangerous goods, hazard and handling labels, etc.)
11th week: Transportation of dangerous goods	12th week: Transportation of dangerous goods Practice: ICAO Dangerous Panel

Practice: DG shipment features and documentation	
13th week: Transportation of dangerous goods	**14th week:** Mid-semester TEST
Practice: IATADangerous Goods Regulations (DGR)	
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance to the practices (absence up to the permissible level)

B, for grade:

The final grade will be the average of the tests. Each test hast to be at least 50%.

Aviation Terminology I

Code: MK3AVT1R01HX17-EN

ECTS Credit Points: 1

Evaluation: mid-semester grade

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 0+1

Topics:

The course aims to provide future pilots with the English language proficiency needed for clear, accurate and problem-free communication without misunderstandings both in voice-only and face-to-face situations even in the case of unexpected events. To achieve this the improvement of General English and the sound acquisition of ICAO phraseology are both required.

Course content:

1. Introduction to air communication (clear communication, asking for repetition, questions-short answers, time expressions, ICAO)
2. Pre-flight (checks, delays, local conditions)
3. Ground movements (asking for more time, giving a reason,
4. Departure, climbing and cruising
5. Enroute events (explaining changes, unusual events, stating a problem)

6. Contact and approach (descent, saying what you are going to do)
7. Landing (landing hazards)
8. On the ground (getting to the gate)

Literature:

Compulsory:

- Sue Ellis-Terence Gerighty: English for Aviation for Pilots and Air Traffic Controllers. Express Series. Oxford Business English. OUP. 2008.ISBN szám: 978 0 19 457943 8
- Philip Shawcross: Flightpath, Aviation English for Pilots and ATCos. Cambridge Professional English. CUP. 2011.ISBN szám: 978-0521178716

Recommended:

- Henry Emery - Andy Roberts: Aviation English Macmillan 2008. ISBN szám: 978 0 23 002757

Schedule

1st week Registration week	
2nd week: **Practice:** Annex 1 Personnel Licensing	3rd week: **Practice:** Annex 1 Personnel Licensing
4th week: **Practice:** Annex 2 Rules of the Air	5th week: **Practice:** Annex 2 Rules of the Air
6th week: **Practice:** Annex 6 Operation of Aircraft	7th week: **Practice:**Annex 6 Operation of Aircraft
8th week: 1st drawing week	
9th week: **Practice:** Annex 6 Operation of Aircraft	10th week: **Practice:** Annex 7 Aircraft Nationality and Registration Marks
11th week: **Practice:** Annex 7 Aircraft Nationality and Registration Marks	12th week: **Practice:** Annex 8 Airworthiness of Aircraft
13th week: **Practice:** Annex 8 Airworthiness of Aircraft	14th week: **Practice:** Annex 8 Airworthiness of Aircraft
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at practice classes is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Aviation Terminology II

Code: MK3AVT2R01HX17-EN

ECTS Credit Points: 1

Evaluation: mid-semester grade

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): Aviation Terminology I

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 0+1

Topics:

The course aims to provide future pilots with the English language proficiency needed for clear, accurate and problem-free communication without misunderstandings both in voice-only and face-to-face situations even in the case of unexpected events. To achieve this the improvement of General English and the sound acquisition of ICAO phraseology are both required.

Course content:

9. Introduction to air communication (clear communication, asking for repetition, questions-short answers, time expressions, ICAO)
10. Pre-flight (checks, delays, local conditions)
11. Ground movements (asking for more time, giving a reason,
12. Departure, climbing and cruising
13. Enroute events (explaining changes, unusual events, stating a problem)
14. Contact and approach (descent, saying what you are going to do)
15. Landing (landing hazards)
16. On the ground (getting to the gate)

Literature:

Compulsory:

- Sue Ellis-Terence Gerighty: English for Aviation for Pilots and Air Traffic Controllers. Express Series. Oxford Business English. OUP. 2008.ISBN szám: 978 0 19 457943 8
- Philip Shawcross: Flightpath, Aviation English for Pilots and ATCos. Cambridge Professional English. CUP. 2011.ISBN szám: 978-0521178716

Recommended:

- Henry Emery - Andy Roberts: Aviation English Macmillan 2008. ISBN szám: 978 0 23 002757

Schedule

1st week Registration week	
2nd week: **Practice:** Annex 10 Aeronautical Telecommunications	3rd week: **Practice:** Annex 10 Aeronautical Telecommunications
4th week: **Practice:** Annex 11 Air Traffic Services	5th week: **Practice:** Annex 11 Air Traffic Services
6th week: **Practice:** Annex 11 Air Traffic Services	7th week: **Practice:** Annex 3 Meteorological Service for International Air Navigation
8th week: 1st drawing week	
9th week: **Practice:** Annex 3 Meteorological Service for International Air Navigation	10th week: **Practice:** Annex 3 Meteorological Service for International Air Navigation
11th week: **Practice:** Annex 4 Aeronautical Charts	12th week: **Practice:** Annex 4 Aeronautical Charts
13th week: **Practice:** Annex 4 Aeronautical Charts	14th week: **Practice:** Annex 5 Units of Measurement to be Used in Air and Ground Operations
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded

by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Aviation Terminology III

Code: MK3AVT3R01HX17-EN

ECTS Credit Points: 1

Evaluation: mid-semester grade

Year, Semester: 2nd year, 2nd semester

Its prerequisite(s): Aviation Terminology II

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+1

Topics:

The course aims to provide future pilots with the English language proficiency needed for clear, accurate and problem-free communication without misunderstandings both in voice-only and face-to-face situations even in the case of unexpected events. To achieve this the improvement of General English and the sound acquisition of ICAO phraseology are both required.

Course content:

17. Introduction to air communication (clear communication, asking for repetition, questions-short answers, time expressions, ICAO)
18. Pre-flight (checks, delays, local conditions)
19. Ground movements (asking for more time, giving a reason,
20. Departure, climbing and cruising
21. Enroute events (explaining changes, unusual events, stating a problem)
22. Contact and approach (descent, saying what you are going to do)
23. Landing (landing hazards)
24. On the ground (getting to the gate)

Literature:

Compulsory:

- Sue Ellis-Terence Gerighty: English for Aviation for Pilots and Air Traffic Controllers. Express Series. Oxford Business English. OUP. 2008.ISBN szám: 978 0 19 457943 8
- Philip Shawcross: Flightpath, Aviation English for Pilots and ATCos. Cambridge Professional English. CUP. 2011.ISBN szám: 978-0521178716

Recommended:

- Henry Emery - Andy Roberts: Aviation English Macmillan 2008. ISBN szám: 978 0 23 002757

Schedule

1st week Registration week	
2nd week: **Practice:** Annex 14 Aerodromes	3rd week: **Practice:** Annex 14 Aerodromes
4th week: **Practice:** Annex 14 Aerodromes	5th week: **Practice:** Annex 14 Aerodromes
6th week: **Practice:** Annex 15 Aeronautical Information Services	7th week: **Practice:** Annex 15 Aeronautical Information Services
8th week: 1st drawing week	
9th week: **Practice:** Annex 9 Facilitation	10th week: **Practice:** Annex 12 Search and Rescue
11th week: **Practice:** Annex 13 Aircraft Accident and Incident Investigation	12th week: **Practice:** Annex 13 Aircraft Accident and Incident Investigation
13th week: **Practice:** Annex 13 Aircraft Accident and Incident Investigation	14th week: **Practice:** Annex 16 Environmental Protection
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Aviation Terminology IV

Code: MK3AVT4R01HX17-EN

ECTS Credit Points: 1

Evaluation: mid-semester grade

Year, Semester: 3rd year, 1st semester

Its prerequisite(s): Aviation Terminology III

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+1

Topics:

The course aims to provide future pilots with the English language proficiency needed for clear, accurate and problem-free communication without misunderstandings both in voice-only and face-to-face situations even in the case of unexpected events. To achieve this the improvement of General English and the sound acquisition of ICAO phraseology are both required.

Course content:

25. Introduction to air communication (clear communication, asking for repetition, questions-short answers, time expressions, ICAO)
26. Pre-flight (checks, delays, local conditions)
27. Ground movements (asking for more time, giving a reason,
28. Departure, climbing and cruising
29. Enroute events (explaining changes, unusual events, stating a problem)
30. Contact and approach (descent, saying what you are going to do)
31. Landing (landing hazards)
32. On the ground (getting to the gate)

Literature:

Compulsory:

- Sue Ellis-Terence Gerighty: English for Aviation for Pilots and Air Traffic Controllers. Express Series. Oxford Business English. OUP. 2008.ISBN szám: 978 0 19 457943 8
- Philip Shawcross: Flightpath, Aviation English for Pilots and ATCos. Cambridge Professional English. CUP. 2011.ISBN szám: 978-0521178716

Recommended:

- Henry Emery - Andy Roberts: Aviation English Macmillan 2008. ISBN szám: 978 0 23 002757

Schedule

1st week Registration week	
2nd week: **Practice:** Annex 17 Security: Safeguarding International Civil Aviation Against Acts of Unlawful Interference	3rd week: **Practice:** Annex 17 Security: Safeguarding International Civil Aviation Against Acts of Unlawful Interference
4th week: **Practice:** Annex 17 Security: Safeguarding International Civil Aviation Against Acts of Unlawful Interference	5th week: **Practice:** Annex 17 Security: Safeguarding International Civil Aviation Against Acts of Unlawful Interference
6th week: **Practice:** Annex 18 The Safe Transport of Dangerous Goods by Air	7th week: **Practice:** Annex 18 The Safe Transport of Dangerous Goods by Air
8th week: 1st drawing week	
9th week: **Practice:** Annex 18 The Safe Transport of Dangerous Goods by Air	10th week: **Practice:** Annex 18 The Safe Transport of Dangerous Goods by Air
11th week: **Practice:** Annex 19 Safety management	12th week: **Practice:** Annex 19 Safety management
13th week: **Practice:** Annex 19 Safety management	14th week: **Practice:** Annex 19 Safety management
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Informatics for Engineers I

Code: MK3INFEA04RX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 1st year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

History of computers, Number systems, number representations, bit, byte, ASCII, Unicode, Hardware, CPU, I/O, Operating systems (BIOS, DOS…), Network architectures (topologies, router, gateway, DNS, IP address), Internet security (https, digital signature…), Databases (basic concepts, database model,DBMS …), Databases (SQL) , Data structures (datatypes, array, list, stack, tree…), Algorithms (sorting, searching…), Computer programming (history of programming, programming languages, Pseudo code, flowchart, development models), Computer programming (variable declarations, datatypes (C), control structures, loops…)

Literature:

Compulsory:

- Microsoft Excel 2016 Bible: The Comprehensive Tutorial Resource
- Microsoft Access 2016 Bible: The Comprehensive Tutorial Resource

Schedule

1st week Registration week	
2nd week: **Lecture:** History of computers **Practice: Excel 1.** Introducing Excel. Basics concepts and functionalities: • Parts of the user interface (workbook, worksheet, cell, range…)	**3rd week: Excel 2.** **Lecture:** Number systems, number representations, bit, byte, ASCII, Unicode **Practice:** Formatting and editing Worksheet: • Font type and size. • Align Text. • Number Format. • Column With, Row Height.

- Entering and editing data, data types.
- Fill a Range with Series.

Basic functions:

- SUM, AVERAGE, COUNT, COUNTA, COUNTIF, MIN, MAX

Trigonometric functions:

- SIN, COS, TAN, PI, RADIANS

Logical functions:

TRUE, FALSE, AND, OR

- Borders.
- Wrap Text.

AutoSum functionality.

Conditional formatting.

4th week: Excel 3.

Lecture: Hardware, CPU, I/O

Practice: Formulas:

- Building Formulas.
- Move or copy a Formula.
- Reference another Range in a Formula.
- Naming groups of data.

Conditional and database functions:

- IF, SUMIF, CHOOSE
- VLOOKUP, HLOOKUP

5th week: Excel 4.

Lecture: Operating systems (BIOS, DOS…)

Practice: Analyzing data:

- Ordering, summarizing, a range.
- Filter a Range.

Summarize data with subtotals.

6th week: Excel 5.

Lecture: Network architectures (topologies, router, gateway, DNS, IP address)

Practice: Graphical representation in Excel:

- Creating Charts.
- Chart types.
- Chart Elements.
- Format and customize Excel Charts.

7th week: Excel 6.

Lecture: Internet security (https, digital signature…)

Practice: Practice for the test.

8th week: 1st drawing week: Excel test

9th week: Acces 1.

Lecture: Databases (basic concepts, database model,DBMS …)

Practice: Database basics, relational database model

Tables, records, fields, keys, primary keys, indexes.

10th week: Acces 2.

Lecture: Databases (SQL)

Practice: User interface of the software.

Database manipulation:

- Create a new database.
- Data types.
- Create and import tables.

Relationship between tables, relationship types.

Design and create a database from a dataset.

- Insert, delete, update records, fields.

Create relation between tables, referential Integrity.

11th week: Acces 3.

Lecture: Data structures (datatypes, array, list, stack, tree…)

Practice: Data manipulation:

Format.
Input masks.

- Fast finding, filtering, and sorting data.

SQL basics.

Select query:

- WHERE, AND, OR, ORDER BY, GROUP BY

12th week: Acces 4.

Lecture: Algorithms (sorting, searching…)

Practice: Queries:

- Crosstab
- Make table
- Append
- Update
- Delete

Calculated fields.

Summarizing data.

13th week: Acces 5.

Lecture: Computer programming (history of programming, programming languages, Pseudo code, flowchart, development models)

Practice: Forms.

Reports.

14th week: Acces 6.

Lecture: Computer programming (variable declarations, datatypes (C), control structures, loops…)

Practice: Practice for the test.

15th week: 2nd drawing week: Acces test

Requirements

A, for a signature:

- participation on the practices,
- at least satisfactory result on both midterm tests.

B. Requirements for the grade:

- same as above,
- final grade = average of the two grades of the midterm tests.

Aircraft Technology

Code: MK3AIRCR04HX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): Engineering Physics, Basics of Aviation I

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

The course teaches the basic knowledge of Aircraft technology in order to gain the prerequisite knowledge for Aircraft General Knowledge — Airframe/Systems/Powerplant I and IIsubjects.

The course covers the following main areas and give basic information on:

System design, loads, stresses and maintenance, airframe, hydraulics, landing gear, wheels, tyres and brakes, flight controls, pneumatics: pressurisation and air conditioning, anti and de-icing systems, fuel system, protection and detection systems, oxygen systems

By conducting the course the student will have the basic prerequisite knowledge in order to be able to commence Aircraft General Knowledge — Airframe/Systems/Powerplant I and II subjects described by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the basic technological background, structures, simple solutions used in airframes, systems and powerplants in aviation.

Learning Objectives (LOs) published by the European Comission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Airframes and Systems, 2015, ISBN szám: 978 1 90620 265 1
- CAE OXFORD AVIATION ACADEMY (UK), Electrics and electronics, 2015, ISBN szám: 978 1 90620 266 8
- CAE OXFORD AVIATION ACADEMY (UK),Powerplant,2015,ISBN szám: 978 1 90620 267 5

Schedule

1st week Registration week	
2nd week: **Lecture:** Systems, loads, stress, maintenance, Structure **Practice:** Lab demonstration, Loads and stresses	**3rd week:** **Lecture:** Wings, empennage, control surfaces, Fuselage, doors, floor, windshield, windows, Control surface types **Practice:** Site visit, aircraft demonstration
4th week: **Lecture:** Hydraulic, Hydraulic systems, Nose wheel steering: structure and operation **Practice:** Lab demonstration, hydraulic fluids	**5th week:** **Lecture:** Brakes, Wheels and tyres **Practice:** Lab demonstration, simplified systems
6th week: **Lecture:** Controls, Secondary controls, De-ice systems, Fuel systems **Practice:** Site visit, aircraft demonstration	**7th week:** **Lecture:** Electric systems basics, Battery, Static electricity: general, Electric parts, Distribution **Practice:** Lab demonstration and examples
8th week: 1st drawing week	
9th week: **Lecture:** Piston engines: general, Fuel, Carburetor and injector systems, Air conditioning **Practice:** Site visit, aircraft demonstration	**10th week:** **Lecture:** Lubrication, Ignition, Mixture **Practice:** Lab demonstration
11th week: **Lecture:** Propellers **Practice:** Performance examples	**12th week:** **Lecture:** Gas turbine engines: general, Fuel (jet), Engine components, Further components and systems **Practice:** Site visit, aircraft demonstration
13th week: **Lecture:** Performance aspects **Practice:** Performance examples	**14th week:** **Lecture:** Detection and protection systems, Other systems **Practice:** Operations presentation
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in an examination.

Descriptive Geometry

Code: MK3DEGRR04HX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Descriptive geometry is a branch of geometry in which the three-dimensional figures (spatial objects) are represented on a plane using one of projecting methods and we must solve some geometrical problems of them in the image plane. The consisting positions, intersecting positions, metrical problems will be investigated.

Introduction to the Monge's method of projecting, projection of the space-elements. Points and lines in the plane. Intersection of a line with the plane. Intersection of two planes. Method of the replacing image-planes (transformation of views). Metric tasks. New views of a polyhedron (using transformation). Intersection of the polyhedrons with lines and planes. Intersection of two polyhedrons. Curved surfaces

Literature:

Compulsory:

- Church, A. E.: Elements of Descriptive Geometry, American Book Company, University of Michigan
- Ledneczky, P.: Descriptive Geometry I., BUTE

- Pare, E. G.,- Loving, R. O. - Hill, I. L. - Pare, R. C.: Descriptive Geometry, Amazon

Schedule

1st week Registration week	
2nd week: Practice: Axonometry, perspective; Introduction to multiview projection	3rd week: Practice: Introduction to the Monge's method of projecting Projection of the space-elements (points, lines, segments, planes), Relative position of two straight lines, Special positions of a straight line to image planes, Special positions of the planes to the image planes
4th week: Practice: Points and lines in the plane Line in a plane, point in a plane First mainline and second mainline in a plane Point in a first/second projecting plane	5th week: Practice: Intersection of a line with the plane Intersection of a line with the projecting plane Intersection of a line with the plane (in general position). Visibility
6th week: Practice: Intersection of two planes The intersection line of projecting planes The intersection line of planes, if one of them is in projecting position Intersection line of two planes	7th week: Practice: Method of the replacing image-planes (transformation of views) Introduction of new image planes, the method of the replacing of an image plane with a new plane
8th week: 1st drawing week	
9th week: Practice: Metric tasks I. Determining distances and angles of the objects Distance between two points. Lenght of the line-segment. Distance from a point to a plane. Distance from a point to a line. Angle of inclination of a line to the image-planes. Angle formed by two planes. Perpendicularity	10th week: Practice: Metric tasks II. Determining distances and angles of the objects Distance between two parallel lines. Distance between two skew lines. Distance between two parallel planes. Angle formed by two lines.
11th week: Practice: Intersection of the polyhedrons with lines and planes	12th week: Practice: Intersection of two polyhedrons I. Intersection of prisms and pyramids

Prisms and pyramids	
13th week:	**14th week:**
Practice: Intersection of two polyhedrons II. Intersection of prisms and pyramids	**Practice: Curved surfaces** (Cylinders, Cones, Spheres) Intersection of the Curved surfaces with planes. Development of a curved surfaces and intersections, Kochanski's Approximation.
15th week: 2nd drawing week	

Requirements

A, for a signature: Regular attendance (Minimum 70 %). Successful accomplishment of three drawings.

B, for grade: Grades will be a composite of homework (30%), mid-term test (35%), end-term test (35%). The homework will be issued five times in the semester. Minimum requirements to pass the semester: successful accomplishment of the drawings and tests (minimum 50%).

Mechanical Machines and Machine Elements

Code: MK3MGEPG04RX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): Aircraft Technology

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

The series of lectures are based on the topics of mechanics. It reviews the standardised presentation of machine elements and tolerance and fit systems; the set-up of a machine group, the connection of its elements and their operation. In the course students acquire the features of prime mowers, machines; the different types of clutches and couplings; the bearing support of shafts and the most widely applied rolling bearings; different types of frictional and positive connection drives; types of brakes and application fields. In practice the different machines and machine elements are introduced and the selection of them from brand catalogues: rolling bearings, couplings, belt and pulley, chain and sprocket.

Literature:

Compulsory:

- Ansel Ugural, NEW JERSEY INSTITUTE TECH: Mechanical Design: An Integrated Approach, 1st Edition Hardcover with access card, ©2004, ISBN-13 9780072921854
- Tiba Zsolt: Machine Drawing, Debrecen University Press 2010. ISBN 978-963-318-066-2,
- Tiba Zsolt: Drivetrain Optimization, Lambert Academic Publishing, 2016. (ISBN: 9783659859274)
- Tiba Zsolt: Basic constructions of machine design, Lambert Academic Publishing, 2017. (ISBN: 978-3-330-34649-9)

Recommended:

- Optibelt: Technical Manual V-belt drives
  http://www.optibelt.com/fileadmin/content/pdf/Produkte/EN/Optibelt-TH-v-belt-drives.pdf
- Rexnord: Roller Chains
  http://www.rexnord.com/ContentItems/TechLibrary/Documents/7010_Rexnord-and-Link-Belt-Rollerchains_Catalog-p.aspx
- SKF General Catalogue
  http://www.skf.com/group/knowledgecentre/subscriptions/displayfactbox.html?itemid=tcm:12-121486

Schedule

1st week Registration week	
2nd week: Lecture: Tolerance and fit systems Practice: Calculation of tolerance types and fits	3rd week: Lecture: Set-up of a machine group, operation and operation requirements Practice: Characteristicsand operation features of prime mowers,machines and precondition of stabile running
4th week: Lecture: Linkage mechanisms, types of constraints. Statically determinate, indeterminate and unstable constructions Practice: Analyzing linkage mechanisms: suspension systems of vehicles and airplanes.	5th week: Lecture: Construction details of shafts and its parts, functions. Keyed and splined joints of shafts transmitting the peripheral force. Practice: Construction of keyed and splined joints, sizing.
6th week:	7th week:

Lecture: Shaft bearing systems. Most widely applied rolling bearings and their features. **Practice:** Introduction of different types of rolling bearings and choosing them from brand catalogue.	**Lecture:** Bearing arrangements. Locating, non-locating bearing arrangement. Cross located bearing arrangements with adjusted or floating bearings. Selection of ball and roller bearings for service life. **Practice:** Explanation of shaft bearing constructions.
8th week: 1st drawing week	
9th week: **Lecture:** Seals, operation principles. Contacting and non -contacting seals and their application fields. **Practice:** Showing the different types of seals, choosing them from brand catalogues.	**10th week:** **Lecture:** Clutches and couplings. Types, operation features, application fields. **Practice:** Stiff, flexible and universal joints. Introduction in lab and choosing from catalogues.
11th week: **Lecture:** Heat balance of braking. Types of brakes, actuation of them, operation method. **Practice:** Showing brakes. Analyzing the operation of them.	**12th week:** **Lecture:** Types of belt drives, operation features, application fields. **Practice:** Pulley constructions, belt sections, design of belt drive, applying design charts.
13th week: **Lecture:** Types of chain drives, operation features, application fields. **Practice:** Sprocket and chain constructions. Design of chain drive, applying design charts.	**14th week:** **Lecture:** Types of gear drives. Operation and their application fields. **Practice:** Explanations of gear drive constructions. Ratio calculation.
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor. Students are required to bring the drawing tasks and drawing instruments of the course to each practice class. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his/her participation as an absence because of the lack of active participation in class.

Students have to **submit all the designing tasks** as scheduled minimum at a sufficient level.

During the semester there are two tests: the mid-term test in the 8th week and the end-term test in the 15th week. Students have to sit for the tests.

B, for a grade:

The course ends in an **examination**. Based on the average of the grades of the designing tasks and the examination, the exam grade is calculated as an average of them:

- the average grade of the two designing tasks
- the result of the examination

The minimum requirement for the mid-term and end-term tests and the examination respectively is 60%. Based on the score of the tests separately, the grade for the tests and the examination is given according to the following table:

Score / Grade

0 - 59 % = fail (1); 60 – 69 % = pass (2); 70 – 79 % = satisfactory (3); 80 - 89 % = good (4); 90 - 100 % = excellent (5)

If the score of any test is below 60, students can take a retake test in conformity with the EDUCATION AND EXAMINATION RULES AND REGULATIONS.

An offered grade: it may be offered for students if the average grade of the designing tasks is at least good (3) and the average of the mid-term and end-term tests is at least good (3). The offered grade is the average of them.

Materials Engineering

Code: MK3ANISG06RX17-EN

ECTS Credit Points: 6

Evaluation: mid-semester grade

Year, Semester: 2nd year, 2nd semester

Its prerequisite(s): Aircraft Technology

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 3+2

Topics:

The aim of the course is to give the basic, and useful material science knowledge to our students, through the presentation of special materials and its tangible analysis. Additionally, students can get closer to medical materials, which are currently being developed at a remarkable scale.

Literature:

Compulsory:

- Chawla, Krishan K. Composite Materials Science and Engineering 3rd ed. Springer 2012
- Nicolais, Luigi; Meo, Michele; Milella, Eva: Composite Materials: A Vision for the Future, 2011 Springer Verlag
- C.P. Poole, F.J. Owens: Introduction to nanotechnology, Wiley Interscience, 2003

Schedule

1st week Registration week	
2nd week: **Lecture:** Overview of the groups of engineering materials and presentation of the latest material science results **Practice:** Preparation of a metallographic sample for semester task	3rd week: **Lecture:** Metals I - overview and presentation of metallic alloys **Practice:** Preparation of a metallographic sample for semester task
4th week: **Lecture:** Metals II - manufacturing technology of metals **Practice:** Preparation of a metallographic sample for semester task	5th week: **Lecture:** Metals III – Material testing and qualification **Practice:** Preparation of a metallographic sample for semester task
6th week: **Lecture:** Metals IV – Theoretical background f metal alloys	7th week: **Lecture:** Polymer I - Overview of Industrial Polymers, Production Technology

Practice: Microscopic analysis to complete the semester task	**Practice:** Microscopic analysis to complete the semester task
8th week: 1st drawing week	
9th week: **Lecture:** Polymer II - Certification procedures for industrial polymers, case studies **Practice:** Microscopic analysis to complete the semester task	**10th week:** **Lecture:** Ceramics I - Overview **Practice:** Microscopic analysis to complete the semester task
11th week: **Lecture:** Ceramics II - Production technology **Practice:** Measurement of toughness toughness and theoretical strength calculation of the ceramic coating of the neural implant.	**12th week:** **Lecture:** Ceramics III - Qualification procedures **Practice:** Measurement of toughness toughness and theoretical strength calculation of the ceramic coating of the neural implant.
13th week: **Lecture:** Composite materials. **Practice:** Presentation of semester task	**14th week:** **Lecture:** Special and Biocompatible materials. **Practice:** Microscopic analysis of human implants
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at practice classes is compulsory. Students must attend practice classes and may not miss more than three practice classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students can't take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certification needs to be presented. Missed practice classes must be made up for at a later date, being discussed with the tutor.

During the semester there are two tests: the mid-term test is on the 8th week and the end-term test is on the 15th week. Students must sit for the tests.

B, for a grade:

The course ends in a mid-semester grade based on the average grade of the two tests.

The minimum requirement of the mid-term and the end-term test is 60% separately. The grade for each test is given according to the following table:

Score / Grade

0 - 59 = fail (1); 60 - 69 =pass (2); 70 - 79 =satisfactory (3); 80 - 89 = good (4); 90 - 100 =excellent (5)

If the score of any test is below 60, the student once can take a retake test of the whole semester material.

Manufacturing Technologies

Code: MK3GYARG04RX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 2nd year, 2nd semester

Its prerequisite(s): Aircraft Technology

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

During this semester the students learn the types of cutting machines, devices and tools. The students will know the types of basic cutting technologies (turning, drilling, milling, planning, grinding, etc.) and their characteristics. Introduction of the basic industrial design- and operation documentation procedure in manufacturing. Primary forming processes (casting, powder metallurgy, metallurgical, hot forming processes). After that the students will learn designing basic manufacturing tasks and calculating the necessary technological parameters for a given workpiece.

Literature:

Compulsory:

- Fritz Klocke:*Manufacturing Processes I, Cutting,*RWTH Edition, RWTH Aachen University, p. 524, ISBN 978-3-642-11978-1
- John A. Schey:*Introduction to Manufacturing Processes,*McGraw – Hill Book Company, 1977., p. 392., ISBN 0-07-055274-6
- Prakash M. Dixit, Uday S. Dixit: *Modelling of Metal Forming and Machining Processes,* Springer-Verlag, 2008, ISBN 978-1-84996-749-5
- Heinz Tschaetsch: *Metal Forming Practise: Processes - Machines – Tools,* Springer-Verlag Berlin Heidelberg, 2006., ISBN 978-3-642-06977-2

Recommended:

- James G. Bralla: *Handbook of Manufacturing Processes,* First Edition, Industrial Press Inc., New York, 2007, ISBN 0-831 1-3179-9

- Helmi A. Youssef, Hassan El – Hofy: *Machining Technology, Machine tools and operations,* CRC Press, United States of Amerika, p. 672, ISBN 978-1-4200-4339-6
- J. Beddoes, M. J. Bibby: *Principles of Metal Manufacturing Processes,* 1999, p. 337, ISBN 0 340 73162 1

Schedule

1st week Registration week	
2nd week: **Lecture:** The basic definitions of manufacturing processes, the types of machine tools **Practice:** Introducing of the cutting laboratory and machine tools *(cutting laboratory)*	3rd week: **Lecture:** Process of chip formation, tool wear and tool life **Practice:** Calculation tasks for tool wear and tool life
4th week: **Lecture:** The process and tools of turning technologies **Practice:** Designing of turning technology	5th week: **Lecture:** The process and tools of drilling and counterbore technologies **Practice:** Designing of drilling and counterbore technologies
6th week: **Lecture:** The process and tools of milling technologies **Practice:** Designing of milling technologies	7th week: **Lecture:** The process and tools of grinding technologies **Practice:** Designing of grinding technology
8th week: 1st drawing week : Test I on cutting technologies	
9th week: **Lecture:** History of metal forming. Definitions, advantages of metal forming. Bulk deformation processes. Sheet metal forming processes. **Practice:** The basic studies of technological planning on CNC machines, cutting tool selection.	10th week: **Lecture:** Properties ofmaterials. Industrial materials. The uniaxial tensile test. Upsetting test. **Practice:** Basic studies of Computer Aided Manufacturing (CAM). The types of manufacturing systems
11th week: **Lecture:** Classification of manufacturing processes (casting, forming, material removal, joining). Advantages of casting. Casting terminology. Sand casting.	12th week: **Lecture:** Classification of different forming processes. Types of rolling. Rolling operations. Equipment of rolling, rolling mills. Thread rolling, ring rolling.

Practice: Planning and finite element simulation of cold rolling technology (SolidWorks and Simufact Forming).	**Practice:** Planning and finite element simulation of cold rolling technology (SolidWorks and Simufact Forming).
13th week:	**14th week:**
Lecture: Classification of forging operations. Types of forging dies. Overview of metal forming of sheet metals. Bending and deep drawing.	**Lecture:** Manufacturing of polymers. Major processes (extrusion, injection molding, blow molding, thermoforming, rotomolding).
Practice: Planning and finite element simulation of die forging technology (SolidWorks and Simufact Forming).	**Practice:** Planning and finite element simulation of die forging technology (SolidWorks and Simufact Forming).
15th week: 2nd drawing week: Test II on metal forming technologies	

Requirements

A, for a signature:

Students have to visit the lectures and seminars. Three absences are acceptable during the seminar. Students have to write two tests from the two parts of the lectures and seminars (cutting technologies and metal forming technologies). They have to write them for minimum at a sufficient level. Based on these result they will get the final practice mark.

B, for a grade:

The course ends in **mid-semester grade**. Based on the average of the marks of the planning task and the average of the test results, the mid-semester grade is calculated as an average of them:

- grade of the planning task
- average grade of the two tests

The minimum requirement for the mid-term and end-term tests is 60%. Based on the score of the tests separately, the grade for the tests is given according to the following table:

0 - 59 % = fail (1); 60 – 69 % = pass (2); 70 - 79 % = satisfactory (3); 80 - 89 % = good (4); 90 - 100 % = excellent (5)

If the score of any test is below 60, a student once can take a retake test covering the whole semester material.

Technique of Measurement

Code: MK3TEMER04HX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade, measurement report

Year, Semester: 2nd year, 2nd semester

Its prerequisite(s): Electrotechnics and Electronics

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Detectors (sensors) and transducers. Grouping the sensors. The measuring device structure and characteristics. Unit of measurement systems. Measurement error. Measurement methods. Electro-mechanical - and electronic instruments. Digital instruments. Microelectronic sensors. Elastic deformation measuring devices. Temperature, light and radiation detectors. Thermocouples, thermometers metal, semiconductor thermometers-; Optical gates-; Capacitive proximity switches-; Ultrasonic sensors-; structure, operating principles and properties. Foil Version strain gauges, semiconductor strain gauges, strain sensor wire, one, two and four-sensor bridge circuit. Fiber optic sensors. Signal processing systems. Pressure, temperature, strain and measurement of rotary motion using National Instruments LabVIEW software.

Literature:

Compulsory:

- Aciatore, David G.: Introduction to mechatronics and measurement systems, Boston, 2007, ISBN:007 125407 2
- Ed. Robert H. Bishop: The Mechatronics Handbook, Section III: Sensors and actuators

Recommended:

- David G. Alciatore, Michael B. Histand: Introduction to mechatronics and measurement systems 1st. McGraw-Hill, 2013. ISBN: 978-0073380230
- U. A. Bakshi – V.U. Bakshi: Electronic Measurement and Instrumentation 1st. Technical Publications Pune, 2009. ISBN: 9788184315295

Schedule

1st week Registration week	
2nd week: Lecture: Basic concepts of measurement. Sensors (sensors) and transducers. The sensors are grouped. The structure and characteristics of the measuring apparatus. Measurement Systems. Measurement errors. Measurement methods. Practical: General description about laboratory	3rd week: Lecture: Theoretical basis of Light electric effect sensors. The photodiode and photovoltaic structure, modes of operation and application. Multi-color LEDs. The structure and characteristics of optical interfaces. The scanner structure and characteristics of CCD sensors. Practical: Examination of solar cell.

regulations. Accident prevention and safety education.	
4th week:	5th week:
Lecture: Types of photo resist and application. The structure and features of a phototransistor. The structure and use of a light pencil. The structure, characterization and application of a liquid crystal display. Practical: Measurement of LED characteristics.	Lecture: Measuring elastic deformation instruments. Piezoelectric and piezoresistive sensors. Elastic deformation measuring instruments. Bellows. Microelectronic capacitive pressure sensors. PN-gradient sensors and the MOSFET structure. Practical: Measurement of elastic deformation
6th week:	7th week:
Lecture: Thermoelectric sensors. The operating principles, construction and characteristics of an infrared motion sensor. Thermoelectric transducer coupling, the PVDF film. Thermocouples, semiconductor structure, function and features of metal thermometers and other thermometers. Practical: Measurement of temperature.	Lecture: An optical gate. Its structure, working principle and characteristics and application areas. Practical: Measurement of an optical gate.
8th week: 1st drawing week	Mid-term test
9th week:	10th week:
Lecture: A capacitive proximity switch. Its structure, working principle, characteristics and application areas. Practical: Measuring of capacitive proximity switch.	Lecture: Ultrasonic sensors. Their structures, working principles, characteristics, and application areas. Practical: Measuring of an ultrasonic distance sensor.
11th week:	12th week:
Lecture: Strain gages. Foil strain gauges, semiconductor strain gauge, strain sensor wires, one, two and four-sensing bridge circuits. Practical: Measuring of strain gages.	Lecture: The Reed switch and magneto inductive sensors. Their structures, working principles, characteristics and Application areas. Practical: Measuring of reed switch.
13th week:	14th week:
Lecture: Description of the main features of the NI LabVIEW software. Practical: National Instrumnets with hardware and software. Edit VI. Measuring	Lecture: Structure of the NI data acquisition systems. DAQ connecting to your computer. Practical: Recording and evaluation of data measured by National Instruments Hardware

system construction, Troubleshooting practice	
15th week: 2nd drawing week: End-term test	

Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory. Participation at practice classes is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up a practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with absence. Missed practices should be made up for at a later date, being discussed with the tutor. Active participation is evaluated by the teacher in every class. If a student's behavior or conduct doesn't meet the requirements of active participation, the teacher may evaluate his or her participation as an absence because of the lack of active participation in the class. Students have to submit all the twelve reports as scheduled minimum at a sufficient level. During the semester there are two tests: the mid-term test is in the 8th week and the end-term test in the 15th week.

B, for grade:

Based on the average of the grades of the reports and the test results, the mid-semester grade is calculated as an average of them: - the average grade of the twelve reports (50 %) - the grade of the tests (50 %). The minimum requirement for end-term test is 60%. Based on the score of the test separately, the grade for the test is given according to the following table:

0-59 % = fail (1); 60-69 % = pass (2); 70-79 % = satisfactory (3); 80-89 % = good (4); 90-100 % = excellent (5)

Environmental, Health, Safety and Ergonomy (Basics of EHS)

Code: MK3EHSAK04RX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 3rd year, 2nd semester

Its prerequisite(s): Environmental Protection and Dangerous Goods

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

The subject covers three main topics:

Environment (E): In connection with environment protection the most important topics are introduced to the students. The subject includes air quality, noise protection, water protection, soil protection, and waste management side topics.

Health (H): Basics of labor and health are discussed. The impact of work on health and the health impact on working ability is also a side topic. The fundamentals of occupational health and work hygiene are also involved.

Safety (S): It involves the basics of labor safety and fire protection. The lectures discuss the personal, material and organizational requirements for safe work, ergonomic fundamentals, personal protective equipment, work safety reviews, employer checks, and workplace risk assessment. Industrial safety and security is also a side topic.

The lectures introduce the most important aspects and the practices focus on examples and plant visits.

Literature:

Recommended:

- Gilbert M. Masters, Wendell P. Ela: Introduction to Environmental Engineering and Science, Pearson New International Edition, 3/E, Pearson, 2013, ISBN:9781292025759
- David L. Goetsch, Occupational Safety and Health for Technologists, Engineers, and Managers, 8th Edition, Pearson, 2015, ISBN:9780133484175
- Richard T. Wright, Environmental Science, Pearson, 2017, ISBN:9780134011271

Schedule

1st week Registration week	
2nd week: Basics of Environmental Protection and Environmental Management **Lecture:** Introduction to environmental protection **Practice:** Global issues on environmental protection	3rd week: Air Quality Control **Lecture:** Basics of air pollution control, processes in the atmosphere, greenhouse gases, ozone layer, smog, acid rain **Practice:** Exercises in connection with air pollution
4th week: Environmental Noise **Lecture:** The basics of environmental noise **Practice:** Noise measuring devices and techniques	5th week: Water Protection **Lecture:** Water protection and quality, pollutants **Practice:** Practice in connection with water protection (plant visit: wastewater treatment plant)
6th week: SoilProtection **Lecture:** Protection of soil quality	7th week: Waste Management **Lecture:** Waste management, possibilities, disposal, techniques and hazardous waste

Practice: Practice in connection with soil protection	**Practice:** Practice in connection with waste management (plant visit)
8th week: 1st drawing week	
9th week: Basics of labor safety and fire protection **Lecture:** Personal, material and organizational requirements for safe work, ergonomic fundamentals **Practice:** Practice in connection with labor safety I. (plant visit)	10th week: Occupational Safety **Lecture:** Personal protective equipment, work safety reviews, employer checks, workplace risk assessment **Practice:** Practice in connection with labor safety II. (plant visit)
11th week: Labor and Health **Lecture:** The impact of work on health and the health impact on working ability **Practice:** Practice in connection with occupational health I.	12th week: Occupational Health and Work Hygiene **Lecture:** Fundamentals of occupational health and work hygiene **Practice:** Practice in connection with occupational health II..
13th week: Industrial Safety and Security **Lecture:** Main goals of industrial safety and security **Practice:** Practice in connection with industrial safety and security	14th week: Mid-semester TEST
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance to the practices (absence up to the permissible level)

B, for grade:

The final grade will be the average of the tests. Each test hast to be at least 50%.

Mechatronic Devices (Sensors, Actuators, Motors)

Code: MK3ERZBR04RX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): Engineering Physics

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

Types of sensors, categories of measurable quantities, static characteristics of the sensors. Typical applications of sensor systems. Sensors for high temperature measurement (infrared radiometers, pyrometers). Different level sensors (capacitance, thermal, floating, microwave, rotary paddle, etc.). Different flow sensors (induction, calorimetry, ultrasonic, thermal conductance, electromagnetic, rotameters, etc.). Measurement of kinematic quantities based on different principles: distance, speed, acceleration, vibration. The role of actuators. Types of actuators. Pneumatic actuators, valves, latches and actuators. Piezoelectric actuators. Contactors and electrical contactors. Midget motors.

Literature:

Compulsory:

- Robert H Bishop, The Mechatronics Handbook, CRC Press, 2007, ISBN 9780849392573 - CAT# 9257

Recommended:

- Sabrie Soloman, Sensors Handbook, Mac-Grow Hill Company, 2010, ISBN : 978-0-07-160571-7, Available on-line at: http://ailab.ijs.si/~blazf/kro/SL/Soloman%20-%20Sensors%20Handbook%202nd%20Edition%20-%202010.pdf

Schedule

1st week Registration week	
2nd week:	**3rd week:**
Lecture: Definition, types of sensors, main error sources of transducers.	**Lecture:** Static and dynamic sensor characteristics, environmental impacts on characteristics.
Practice: Application of ultrasonic distance sensor.	**Practice:** Application of pressure sensor.
4th week:	**5th week:**
Lecture: Position sensors.	**Lecture:** Level sensors.
Practice: Application of color sensors.	**Practice:** Application of level sensors.
6th week:	**7th week:**
Lecture: Flowmeters.	**Lecture:** High temperature measurement.
Practice: Application of temperature and humidity sensors.	**Practice:** Application of gas sensor.
8th week: 1st drawing week	

9th week: **Lecture:** Chemical sensors: humidity, gas sensor, etc. **Practice:** Application of light sensors.	10th week: **Lecture:** Measurement of kinematic quantities. **Practice:** Application of acceleration sensor.
11th week: **Lecture:** Force and torque measurement. **Practice:** Application of vibration sensor.	12th week: **Lecture:** Role of actuators, types of actuators. **Practice:** QNET Mechatronics sensor trainer.
13th week: **Lecture:** Electromechanical Actuators: DC Motors, AC Motors, Linear Motors, Stepper Motors, Midget Motors. **Practice:** QNET HVAC trainer.	14th week: **Lecture:** Piezoelectric actuators, magnetostriction actuators, magneto hydrodynamic activators, memory metal actuators. **Practice:** QNET motors trainer.
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory. Participation at practice classes is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up a practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. Missed practice classes must be made up for at a later date, being discussed with the tutor. Active participation is evaluated by the teacher in every class. The student has to prepare measurement report on every practise and has to submit the reports until deadline.

B, for a grade:

For the mid-semester grade the student has to write two tests. The mid-semester grade is received in scoring system (total 100) by the following:

- 1st test with 40 points
- 2nd test with 40 points
- quality of the measurement reports with 20 points

The mid-semester grade is given according to the following table:

Score	0-59 %	60-69%	70-79 %	80-89 %	90-100 %
Grade	fail (1)	pass (2)	satisfactory (3)	good (4)	excellent (5)

Basics of Aviation I

Code: MK3PPL1R02HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 1st year, 1stsemester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+1

Topics:

The course teaches the basic knowledge of Aviation in order to assist the students to understand the key subsystems and their interrelations. The aim is to prepare the students for conducting the first flight trainings while having the relevant basic information about the environment the pilots are working in.

Part I of the course covers the following main areas and with airport and PHARMAFLIGHT training center visits give practical thorough information on:

the most important stakeholders (airline, airport, airspace, air traffic management, maintenance, training organizations), international organizations and the regulatory environment, the tasks of the individual players, the basic requirements that apply to it, airlines and airport organizational structures, their main operational documents

By conducting both Part of the course the student will have the basic theoretical and practical knowledge to carry on with the first summer flying where they have the opportunity to make an intense flight programme.

Literature:

Recommended:

- Alexander T. Wells, Ed.D. & Seth Young, Ph.D. (2011): Airport Planning and Management, 6th Edition, ISBN-13: 978-0071750240, ISBN-10: 007175024X
- Massoud Bazargan (2016): Airline Operations and Scheduling, 2nd Edition, ISBN-13: 978-0754679004, ISBN-10: 0754679004

Schedule

1st week Registration week	
2nd week:	3rd week:
Practice: PHARMAFLIGHT VISIT: The system of Aviation, stakeholders and their relationships (airline, airport, airspace, air	Practice: PHARMAFLIGHT VISIT, Aviation trainings, licenses, ratings (pilots, cabin crew, maintenance, air traffic control, ground officer), training organizational

navigation service provider, maintenance, training organizations, etc.)	requirements, flight simulation training devices
4th week:	5th week:
Practice: PHARMAFLIGHT VISIT, International organizations, (ICAO, IATA, EASA, FAA), their functions, duties, regulatory and supervisory powers, tasks of the national aviation authority (NAA), basic communication principles with NAA	**Practice:** AIRCRAFT DEMONSTRATION: History of Aviation, technical development stages, principle of flights, basics of areodinamics, forces, types and of characteristics of aircrafts, dimensions, controls
6th week:	7th week:
Practice: AIRPORT VISIT, Airports, design and constructions, categories, subsystems, airport services, ground handling, basic operational processes	**Practice:** AIRPORT VISIT, Airport organization, The organizational structure of the airports, the operation of the airport and the relationship between the other service providers, the structure of the aerodrome manual
8th week: 1st drawing week	
9th week:	10th week:
Practice: AIRPORT VISIT, Air traffic management, ATM basics, types of airspaces, air traffic rules	**Practice:** AIRPORT VISIT, Air traffic services, aeronautical information, role and structure of AIP, NOTAM publications, flight plan, ATC permissions, ATFM, slot management
11th week:	12th week:
Practice: AIRLINES DEMONSTRATION, categories, organizational units (OPS, CAMO, etc.), structure of flight, basic operational processes, operating models: traditional and low-cost airlines, network carrier and point-to-point carrier, hub and spoke system, global airline associations	**Practice:** AIRLINES DEMONSTRATION, Organizational structure of the airlines, internal and external relations of organizational units, airline manuals
13th week:	14th week:
Practice: AIRCRAFT DEMONSTRATION, Aircraft maintenance, type certificate, continuous airworthiness, airworthiness review certificate, basic documentation of maintenance, work orders, levels and types of maintenance (line, hangar, A-B-C-D	**Practice:** AIRPORT VISIT, Emergency planning, Flight accidents, categories, reporting system, investigation principles and process, competencies, goals

check); organizational requirements, quality management; methods (Lean, 5S)	

15th week: 2nd drawing week

Requirements

A, for a signature:

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Basics of Aviation II

Code: MK3PPL2R03HX17-EN

ECTS Credit Points: 3

Evaluation: mid-semester grade

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): Basics of Aviation I

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+3

Topics:

The course teaches the basic knowledge of Aviation in order to assist the students to understand the key subsystems and their interrelations. The aim is to prepare the students for conducting the first flight trainings while having the relevant basic information about the environment the pilots are working in.

By conducting Part II of the course the students will be familiarizied with airport and airline environment, training regulations, dispatch procedures, pre-flight planning, training aircraft, and post flight requirements including logbook maintenance and emergency procedures. In the first flight training hours the student will become familiar with the training aircraft, its operating characteristics, flight controls, basic instruments and system, general good operating techniques and safety procedures. At the completion the student shall be able to, with assistance, conduct a pre-flight, use the checklist, perform a

run-up check of engine and systems, and know how to use the controls to move the airplane about its respective axis and become familiar with the controls of the aircraft and the effect of them during flight and learn how to taxi for take-off and to the parking area after landing.

By conducting both Part of the course the student will have the basic theoretical and practical knowledge to carry on with the first summer flying where they have the opportunity to make an intense flight programme.

Literature:

Recommended:

- CAE OXFORD AVIATION ACADEMY (UK), General Navigation, 2015, ISBN szám: 978 1 90620 273 6
- CAE OXFORD AVIATION ACADEMY (UK), Operational Procedures, 2015, ISBN szám: 978 1 90620 275 0
- CAE OXFORD AVIATION ACADEMY (UK),Mass and Balance - Performance, 2015, ISBN szám: 978 1 90620 269 9

Schedule

1st week Registration week	
2nd week: Practice: AIRPORT OPERATION, Airport visit, Airside and landside operations, facilities, airport technical services Airport management and operational systems: resource management, aircraft stands, check-in counters, boarding gates allocation, Airport security and safety, aircraft geometry and aircraft manoeuvring areas, lights, signs and markings, Aircraft rescue and fire-fighting, emergency planning	3rd week: Practice: AIRLINE OPERATIONS, Airline Management systems, structure of the documents, Airline Operation Control Center, primary functions and roles, operational systems: Navigational Database, Crew Planning, Flight Scheduling, Maintenance Planning, Demonstration of the main documents: Operations Manual PART A, PART B, PART C, PART D, Organisation Management Manual (OMM), Continous Airworthiness Management Exposition (CAME), Maintenance program, flight planning, approach and landing procedures, climb and descent
4th week: Practice: SATEFY MANAGEMENT SYSTEM IN AVIATION, regulatory background, ICAO Annex 19 - Safety Management, ICAO Doc 9859 - Safety Management Manual, SMS fundamentals, safety culture, Designing and operating an SMS, Principles and Objectives of the Safety Management System, Safety	5th week: Practice: AIRCRAFT GENERAL KNOWLEDGE, Aircraft demonstration, Instruments And Displays, Pressure, Fuel, Temperature, Flow Rate, Rpm, Altitude, Speed Measure, Transmitters, Aerodynamic Parameter Measure, Vario, Magnetism: Magnetic Compass,

Policy and aims, responsibilities, documentation, risk assessment, Flight Safety Strategies, SHELL Model, Safety Management Sysem Manual (SMSM), Safety Risk Management, promotion, training, communication	Gyroscope Instruments, bank and turn Indicator, Altitude Indicator, Stall Indicators, Radio Altimeter, Display Units, Communication Systems, VHF, HF and Satcom
6th week: **Practice:** FLIGHT PERFORMANCE AND FLIGHT PLANNING, Aircraft demonstration, Weight and center of gravity, Weight limitations, CG position limitations, Loading: terminology, Weight limits, Weight calculations, Aircraft weight and CG parameters, CG calculation documents, CG position determination, performance, Flight Planning and check, VFR navigation planing, Fuel planing, Before flight fuel calculations	**7th week:** **Practice:** BASICS OF METEOROLOGY, the atmosphere, temperature, Wind, Turbulence, air masses and fronts, pressure systems, QFE, QNH, Water Shapes in Air, clouds and fog, flight hazards (icing, windshear, thunderstorm), meteorological information, weather charts
8th week: 1st drawing week	
9th week: **Practice:** NAVIGATION, General navigation, The solar system, Time and exchange time, Headings, Distance, Magnetism and compass, Basic principles, Meridians, parallels, ortodroma, loxodroma, Valid aeronautical charts, VFR Communication, Basic procedures, Meteorological phrases (VFR), Procedures in case of radio failure, Emergency and urgency procedures, Ground speed calculation, Heading correction, Flight log book	**10th week:** **Practice:** AIRCRAFT FAMILIARIZATION AND PREPARATION FOR FLIGHT, Pre-flight weather procedure and planning requirements (Weight & balance, Take off and landing performance computations), Emergency drills (Action in the event of fire on the ground and in the air, Engine cabin and electrical system fire, Post flight requirements (Return and securing of aircraft), Familiarization with the aeroplane (Characteristics of the aeroplane, Cockpit layout, systems, Check lists, drills, controls), Systems failure, Escape drills, location and use of emergency equipment and exits), Aircraft maintenance discrepancy procedures, Logbook maintenance and debriefing
11th week: **Practice:** PREPARATION FOR AND ACTION AFTER FLIGHT, Flight authorization and aeroplane acceptance including technical log and certificate of maintenance, Equipment required, such as maps, etc., Completion of authorization sheet and serviceability	**12th week:** **Practice:** AIR EXPERIENCE BRIEFING, Review current and forecast weather/Notams, Review performance planning/weight and balance, Review lesson objectives and establish targets, Performing pre-flight line inspection to

documents, External checks, Internal checks, Harness, seat and rudder pedal adjustments, Starting and warm up checks, Power checks, Running down system checks and switching off the engine, Leaving the aeroplane parking, security and picketing (e.g. tie down)	include required aircraft documents, Correct use of the checklist, FLIGHT LESSON, Engine start and engine controls, Radio communications on the ground and in flight, Taxi -speed and directional control including use of brakes, Pre-takeoff checks (run-up), Normal take-off, Traffic pattern departure, Local area familiarization, Straight and level flight (VR), Trim technique, Medium banked turns (VR) and how to clear for traffic before turning, Climbs (VR), Glides (VR), Demonstrate traffic pattern entry approach and normal landing, Parking, shutdown, and securing airplane
13th week: **Practice:** EFFECTS OF CONTROLS – ATTITUDES AND MOVEMENTS BRIEFING, Primary effects when laterally level and when banked using the aileron and the rudder, Effects of Airspeed and Power using the elevator during climb descend, Trimming controls, Flaps, Effects of Nose Attitude, Airspeed and Power, Operation of Mixture control, Carburetor heat, Cabin heating/ventilation, FLIGHT LESSON Engine start and engine e controls, Local area familiarization which may include short point to point flight, Straight and level flight, Trim technique, Medium banked turns and how to clear for traffic before turning, Climbs, Glides	**14th week:** **Practice:** TAXIING AND GROUND EMERGENCIES BRIEFING, undercarriage structure, brake technic, taxiway signs, fire extinguishing, FLIGHT LESSON, Pre-taxi checks, Starting, control of speed and stopping, Engine handling, Control of direction and turning, Turning in confined spaces, Parking area procedure and precautions, Effects of wind and use of flying controls, Effects of ground surface, Freedom of rudder movement, Marshalling signals, Instrument checks, Air traffic control procedures, Emergencies, Brake and steering failure
15th week: 2nd drawing week	

Requirements

A, for a signature:

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Theoretical Knowledge of Airline Transport Pilot Licence I (ATPL)

Code: MK3TKA1R03HX17-EN

ECTS Credit Points: 3

Evaluation: mid-semester grade

Year, Semester: 1st year, 1stsemester

Its prerequisite(s): -

Further courses are built on it: Yes/no

Number of teaching hours/week (lecture + practice): 2+1

Topics:

The course (Part I, II and III together) teaches the basic knowledge of Principle of Flight to demonstrate a level that grants a successful authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

Part I of the course covers the following main areas and give thorough information on:

The basic aerodynamic theory, subsonic aerodynamics, drag and wake, the lift coefficient Cl, the drag coefficient Cd, the stall, flaps and spoilers

By conducting all Part of the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the complex low speed aerodynamics of aeroplanes.

Learning Objectives (LOs) published by the European Commission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Principles of Flight, 2015, ISBN: 978 1 90620 276 7

Schedule

1st week Registration week	
2nd week: **Lecture:** SUBSONIC AERODYNAMICS, Basics, laws and definitions, Laws and definitions, Basics about airflow, Aerodynamic forces and moments on aerofoils, Shape of an aerofoil section, Wing shape **Practice:**Airflow examples, calculations	**3rd week:** **Lecture:** SUBSONIC AERODYNAMICS, Two-dimensional airflow around an aerofoil, Streamline pattern, Stagnation point, Pressure distribution, Centre of pressure and aerodynamic centre, Lift and downwash **Practice:** Calculation examples
4th week: **Lecture:** SUBSONIC AERODYNAMICS, Drag and wake, Influence of angle of attack, Flow separation at high angles of attack, The lift **Practice:** Calculation examples	**5th week:** **Lecture:** SUBSONIC AERODYNAMICS, Coefficients, The lift coefficient Cl, The drag coefficient Cd, Three-dimensional airflow about an aeroplane, Streamline pattern, Induced drag, Total drag, Parasite drag and speed, Induced drag and speed, **Practice:** Lift and drag examples, calculations,Total drag and speed, The total drag–speed graph
6th week: **Lecture:** SUBSONIC AERODYNAMICS, Ground effect, Effect on CDi, Effect on stall, Effect on CL, Effect on take-off and landing characteristics of an aeroplane **Practice:** Ground effect examples, calculations	**7th week:** **Lecture:** SUBSONIC AERODYNAMICS, The relationship between lift coefficient and speed in steady, straight and level flight, Represented by an equation, Represented by a graph **Practice:** Ground effect examples, calculations
8th week: 1st drawing week	
9th week: **Lecture:** SUBSONIC AERODYNAMICS, The stall, Flow separation at increasing angles of attack, The stall speed **Practice:** Stall examples, calculations	**10th week:** **Lecture:** SUBSONIC AERODYNAMICS, The initial stall in span-wise direction, Stall warning, Special phenomena of stall **Practice:** Stall examples, calculations
11th week: **Lecture:** SUBSONIC AERODYNAMICS, CLMAX ugmentation, Trailing-edge flaps and the reasons for use in take-off and landing,	**12th week:** **Lecture:** SUBSONIC AERODYNAMICS, Spoilers and the reasons for use in the different phases of flight, Speed brakes, The boundary layer,

Leading-edge devices, Vortex generators, Means to reduce the CL–CD ratio **Practice:** Flaps in operation, demonstration	Different types, Aerodynamic degradation, Ice and other contaminants **Practice:** Spoilers in operation, demonstration
13th week: **Lecture:** HIGH-SPEED AERODYNAMICS, Speeds, Speed of sound, Mach number, Compressibility, Subdivision of aerodynamic flow, Shock waves, Normal shock waves, Oblique shock waves **Practice:** High-speed case studies	**14th week:** **Lecture:** Mach cone, Effects of exceeding Mcrit, Mcrit, Effect on lift, on drag, on pitching moment, on control effectiveness, Buffet onset, Means to influence Mcrit **Practice:** High-speed case studies
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Theoretical Knowledge of Airline Transport Pilot Licence (ATPL) II

Code: MK3TKA2R02HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): Theoretical Knowledge of Airline Transport Pilot Licence (ATPL) I

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 1+0

Topics:

The course (Part I, II and III together) teaches the basic knowledge of Principle of Flight to demonstrate a level that grants a successful authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

Part II of the course covers the following main areas and give thorough information on:

Stability, Neutral point, Location of centre of gravity, The Cm–α graph, Cn–β graph, Cl–β graph, Control, Yaw (directional) control, Roll (lateral) control, Mass balance, Trimming

By conducting all Part of the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the complex high speed aerodynamics of aeroplanes.

Learning Objectives (LOs) published by the European Commission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Principles of Flight, 2015, ISBN: 978 1 90620 276 7

Schedule

1st week Registration week	
2nd week: Lecture: STABILITY, Static and dynamic stability, Basics and definitions, Precondition for static stability, Sum of forces, Sum of moments	3rd week: Lecture: STABILITY, Static and dynamic longitudinal stability, Methods for achieving balance, Static longitudinal stability, Neutral point, Location of centre of gravity, The Cm–α graph
4th week: Lecture: STABILITY, The elevator position versus speed graph (IAS), The stick force versus speed graph (IAS),	5th week: Lecture: STABILITY, The manoeuvring stability/stick force per G, Stick force per G and the limit-load factor, Dynamic longitudinal stability
6th week: Lecture: STABILITY, Static directional stability, Sideslip angle β, Yaw-moment coefficient Cn, Cn–β graph	7th week: Lecture: STABILITY, Static lateral stability, Bank angle Ø, The roll-moment coefficient Cl
8th week: 1st drawing week	

9th week:	10th week:
Lecture: STABILITY, Contribution of sideslip angle β, The Cl–β graph	Lecture: STABILITY, Dynamic lateral/directional stability, Effects of asymmetric propeller slipstream, Tendency to spiral dive, Dutch roll
11th week:	12th week:
Lecture: CONTROL, General, *Basics, the three planes and three axes, Camber change, Angle-of-attack change,* Pitch (longitudinal) control*, Elevator/all-flying tails, Downwash effects, Ice on tail, Location of centre of gravity, Moments due to engine thrust*	Lecture: CONTROL, Yaw (directional) control*, Rudder limiting*, Roll (lateral) control*, Ailerons, Spoilers, Adverse yaw, Means to avoid adverse yaw*
13th week:	14th week:
Lecture: CONTROL, Roll/yaw interaction, Means to reduce control forces*, Aerodynamic balance, Artificial means*	Lecture: CONTROL, Mass balance, Trimming, *Reasons to trim, Trim tabs, Stabiliser trim*
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Theoretical Knowledge of Airline Transport Pilot Licence (ATPL) III

Code: MK3TKA3R02HX17-EN

ECTS Credit Points: 2

Evaluation: official exam

Year, Semester: 2nd year, 2nd semester

Its prerequisite(s): Theoretical Knowledge of Airline Transport Pilot Licence (ATPL) II

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 1+1

Topics:

The course (Part I, II and III together) teaches the basic knowledge of Principle of Flightto demonstrate a level that grants a successful authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

Part II of the course covers the following main areas and give thorough information on:

Limitations, Manoeuvring envelope, Gust envelope, propellers, conversion of engine torque to thrust, Secondary effects of propellers, flight mechanics, Forces acting on an aeroplane, Asymmetric thrust

By conducting all Part of the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the complex high speed aerodynamics of aeroplanes.

Learning Objectives (LOs) published by the European Commission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Principles of Flight, 2015, ISBN: 978 1 90620 276 7

Schedule

1st week Registration week	
2nd week: Lecture: LIMITATIONS, Operating limitations, *Flutter, Aileron reversal, Landing gear/flap operating* Practice: limitation examples	3rd week: Lecture: LIMITATIONS, *VMO, VNO, VNE, MMO* Practice: VMO, VNO, VNE, MMO examples
4th week: Lecture: LIMITATIONS, Manoeuvring envelope, *Manoeuvring-load diagram, Factors affecting the manoeuvring-load diagram* Practice: Examples on Manoeuvring-load diagram	5th week: Lecture: LIMITATIONS Gust envelope, *Gust-load diagram, Factors affecting the gust-load diagram.* Practice: Examples on Gust-load
6th week: Lecture: PROPELLERS, Conversion of engine torque to thrust, *Relevant propeller parameters, Blade twist,*	7th week: Lecture: PROPELLERS, *Fixed pitch and variable pitch/constant speed, Propeller*

Practice: Propellers in operation, demonstration	*efficiency versus speed, Effects of ice on propeller* **Practice:** Propellers in operation, demonstration
8th week: 1st drawing week	
9th week: **Lecture:** PROPELLERS, Engine failure*, Windmilling drag, Feathering,* Design features for power absorption*, Aspect ratio of blade, Diameter of propeller, Number of blades, Propeller noise* **Practice:** Engine failure case studies	**10th week:** **Lecture:** PROPELLERS, Secondary effects of propellers*, Torque reaction, Gyroscopic precession, Asymmetric slipstream and blade effect* **Practice:** Examples on torque reaction, Asymmetric slipstream and blade effect
11th week: **Lecture:** FLIGHT MECHANICS, Forces acting on an aeroplane*, Straight horizontal steady flight, Straight steady climb,* **Practice:** Forces examples, climb case studies	**12th week:** **Lecture:** FLIGHT MECHANICS, *Straight steady descent, Straight steady glide, Steady coordinated turn* **Practice:** Forces examples, descent, glide, turn case studies
13th week: **Lecture:** FLIGHT MECHANICS, Asymmetric thrust*, Moments about the normal axis, Forces parallel to the lateral axis, Influence of aeroplane mass* **Practice:** Asymmetric trust example	**14th week:** **Lecture:** FLIGHT MECHANICS, *Secondary propeller effects, VMCA, VMCL, VMCG, Influence of density,* Particular points on a polar curve **Practice:** Secondary propeller effects example
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

Aircraft General Knowledge I - Airframe, Systems, Power Plants (ATPL)

Code: MK3AGK1R04HX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): Theoretical Knowledge of Airline Transport Pilot Licence I (ATPL)

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

The course (Part I and II together) teaches the comprehensive knowledge of Aircraft General Knowledge — Airframe/Systems/Powerplant to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

Part I of the course covers the following main areas and give thorough information on:

System design, loads, stresses and maintenance, airframe, hydraulics, landing gear, wheels, tyres and brakes, flight controls, pneumatics: pressurisation and air conditioning

By conducting both Part of the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the complex technological background, structures, solutions used in airframes, systems and powerplants in aviation.

Learning Objectives (LOs) published by the European Comission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Airframes and Systems, 2015, ISBN szám: 978 1 90620 265 1
- CAE OXFORD AVIATION ACADEMY (UK), Electrics and electronics, 2015, ISBN szám: 978 1 90620 266 8
- CAE OXFORD AVIATION ACADEMY (UK),Powerplant,2015, ISBN szám:978 1 90620 267 5

Schedule

1st week Registration week	
2nd week: **Lecture:** SYSTEM DESIGN, LOADS, STRESSES, MAINTENANCE, System design, Design concepts, Level of certification, Loads and stresses **Practice:** Lab demonstration, Loads and stresses	3rd week: **Lecture:** SYSTEM DESIGN, LOADS, STRESSES, MAINTENANCE, Fatigue, Corrosion, Maintenance, Maintenance methods: hard time and on condition **Practice:** Examples on Fatigue, Corrosion
4th week: **Lecture:** AIRFRAME, Construction and attachment methods, Materials, Aeroplane: wings, tail surfaces and control surfaces, Design and construction, Structural components, Loads, stresses and aeroelastic vibrations ('flutter') **Practice:** Site visit, aircraft demonstration	5th week: **Lecture:** AIRFRAME, Fuselage, landing gear, doors, floor, windscreen and windows, Structural limitations **Practice:** Site visit, aircraft demonstration
6th week: **Lecture:** HYDRAULICS, Hydromechanics: basic principles **Practice:** Site visit, aircraft demonstration	7th week: **Lecture:** HYDRAULICS, Hydraulic systems, Hydraulic fluids: types, characteristics, limitations, System components: design, operation, degraded modes of operation, indications and warnings **Practice:** Lab demonstration, hydraulic fluids
8th week: 1st drawing week	
9th week: **Lecture:** LANDING GEAR, WHEELS, TYRES, BRAKES, Landing gear, Types, System components, design, operation, indications and warnings, on-ground/in-flight protections, emergency extension systems, Nose-wheel steering: design, operation **Practice:** Lab demonstration, simplified landing gears	10th week: **Lecture:** LANDING GEAR, WHEELS, TYRES, BRAKES, Brakes, Types and materials, System components, design, operation, indications and warnings, Anti-skid, Autobrake, Wheels, rims and tyres, Types, structural components and materials, operational limitations, thermal plugs **Practice:** Lab demonstration, simplified brakes
11th week:	12th week:

Lecture: FLIGHT CONTROLS, Aeroplane: primary flight controls, Manual controls, Fully powered (irreversible), Partially powered controls (reversible), System components, design, operation, indications and warnings, degraded modes of operation, jamming **Practice:** Site visit, aircraft demonstration	**Lecture:** FLIGHT CONTROLS, Aeroplane: secondary flight controls, System components, design, operation, degraded modes of operation, indications and warnings, Aeroplane: Fly-by-Wire (FBW) control systems **Practice:** Site visit, simulator demonstration
13th week: **Lecture:** PNEUMATICS — PRESSURISATION AND AIRCONDITIONING SYSTEMS, Pneumatic/bleed air supply, Piston-engine air supply, Gas turbine engine: bleed air supply **Practice:** Site visit, aircraft demonstration	**14th week:** **Lecture:** PNEUMATICS, Aeroplane: pressurisation and air-conditioning system, System components, design, operation, degraded modes of operation, indications and warnings **Practice:** Site visit, aircraft demonstration
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Aircraft General Knowledge II - Airframe, Systems, Power Plants (ATPL)

Code: MK3AGK2R04HX17-EN

ECTS Credit Points: 4

Evaluation: official exam

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): Aircraft General Knowledge I - Airframe, Systems, Power Plants (ATPL)

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+1

Topics:

The course (Part I and II together) teaches the comprehensive knowledge of Aircraft General Knowledge — Airframe/Systems/Powerplant to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

Part II of the course covers the following main areas and give thorough information on:

, anti and de-icing systems, fuel system, protection and detection systems, oxygen systems,DC and AC electrics, switches, generators and alternators, aircraft electric power system, piston engines, lubrication, cooling, ignition, fuel, mixture, carburettors, turbine engines, air inlets, compressors, combustion chambers, exhaust, thrust, auxiliary power units, bleed air

By conducting the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the complex technological background, structures, solutions used in airframes, systems and powerplants in aviation.

Learning Objectives (LOs) published by the European Comission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Airframes and Systems, 2015, ISBN szám: 978 1 90620 265 1
- CAE OXFORD AVIATION ACADEMY (UK), Electrics and electronics, 2015, ISBN szám: 978 1 90620 266 8
- CAE OXFORD AVIATION ACADEMY (UK),Powerplant,2015, ISBN szám:978 1 90620 267 5

Schedule

1st week Registration week	
2nd week: **Lecture:** ANTI-ICING AND DE-ICING SYSTEMS, design, operation, indications and warnings, operational limitations, Ice-	3rd week: **Lecture:** FUEL SYSTEM, Piston engine, Fuel: types, characteristics, limitations, operation, system components, indications **Practice:** Site visit, aircraft demonstration

warning systems: types, operation, and indications **Practice:** Site visit, aircraft demonstration	
4th week: **Lecture:** FUEL SYSTEM, Turbine engine, Fuel: types, characteristics, limitations, operation, system components, indications **Practice:** Examples on fuel characteristics	**5th week:** **Lecture:** ELECTRICS, General, definitions, basic applications: circuit breakers, logic circuits, Static electricity, Direct current and Alternating, Resistors, capacitors, inductance coil, Permanent magnets, Electromagnetism, Circuit breakers, Semiconductors and logic circuits, Batteries **Practice:** Lab demonstration
6th week: **Lecture:** ELECTRICS, Generation, DC, AC generation, Constant Speed and Intergrated Drive (CSD/IDG) systems, Transformers, Distribution, General, distribution, load management and monitoring systems: automatic generators and bus switching during normal and failure operation, indications and warnings, Electrical motors, General, Operating principle, Components **Practice:** Lab demonstration	**7th week:** **Lecture:** PISTON ENGINES, General, Types of internal-combustion engines: basic principles, definitions, Engine: design, operation, components and materials, Fuel, Types, grades, characteristics, limitations, Engine fuel pumps **Practice:** Site visit, aircraft demonstration
8th week: 1st drawing week	
9th week: **Lecture:** PISTON ENGINES, Carburettor/injection system, Lubrication systems, Ignition circuits, Mixture, Definition, characteristic mixtures, control instruments, associated control levers, indications **Practice:** Lab demonstration	**10th week:** **Lecture:** PISTON ENGINES, Aeroplane: propellers, Definitions, Constant-speed propeller: design, operation, system components, Reduction gearing, Propeller handling: associated control levers, degraded modes of operation, indications and warnings, Performance and engine handling, **Practice:** Performance examples
11th week: **Lecture:** TURBINE ENGINES, Basic principles, Basic generation of thrust and the thrust formula, types of turbine engines, components, Coupled turbine	**12th week:** **Lecture:** TURBINE ENGINES, Main-engine components, Aeroplane: air intake, Compressor and diffuser, Combustion chamber, Turbine, Aeroplane: exhaust, Additional components and systems, Engine fuel system, control system,

engine, Free turbine engine: design, operation, components and materials **Practice:** Operations presentation	lubrication, auxiliary gearbox, ignition, starter, Reverse thrust **Practice:** Operations presentation
13th week: **Lecture:** TURBINE ENGINES, Engine operation and monitoring, General, Starting malfunctions, Re-light envelope, Performance aspects, Thrust, performance aspects, and limitations, Auxiliary Power Unit (APU), operation, functions, operational limitations **Practice:** Operations presentation	**14th week:** **Lecture:** PROTECTION AND DETECTION SYSTEMS, Smoke detection, Types, design, operation, indications and warnings, Fire-protection systems, Fire extinguishing (engine and cargo compartments), Fire detection, Rain-protection system, OXYGEN SYSTEMS **Practice:** Operations presentation
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

Aircraft General Knowledge – Instrumentation (ATPL)

Code: MK3AGKIR04HX17-EN

ECTS Credit Points: 4

Evaluation: official exam

Year, Semester: 3rd year, 2nd semester

Its prerequisite(s): Aircraft General Knowledge I - Airframe, Systems, Power Plants (ATPL)

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+3

Topics:

The course teaches the basic knowledge of Aircraft General Knowledge — Instrumentation to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

The course covers the following main areas and give thorough information on:

Sensors and instruments, measurement of air data parameters , magnetism: direct reading compass and flux valve, gyroscopic instruments, inertial navigation and reference systems, aeroplane: automatic flight control systems, trims, yaw damper and flight envelope protection, autothrottle: automatic thrust control system, communication systems, fms, alerting systems and proximity systems, integrated instruments: electronic displays, maintenance, monitoring and recording systems, digital circuits and computers

By conducting the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand thecomplex knowledge of instrumentation used in general and professinonal aviation by simple, complex and jet airplanes.

Learning Objectives (LOs) published by the European Comission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Instrumentation, 2015, ISBN szám: 978 1 90620 268 2

Schedule

1st week Registration week	
2nd week: **Lecture:** SENSORS AND INSTRUMENTS, Pressure gauge, Temperature sensing, Fuel gauge, Fuel flowmeters, Tachometer, Thrust measurement, Engine torquemeter, Synchroscope, Engine-vibration monitoring, Time measurement **Practice:** Lab demonstration	3rd week: **Lecture:** MEASUREMENT OF AIR-DATA PARAMETERS, Pressure measurement, Definitions, Pitot/static system: design and errors, Temperature measurement, Angle-of-attack measurement, Altimeter, Vertical Speed Indicator (VSI), Airspeed Indicator (ASI), Machmeter, Air-Data Computer (ADC) **Practice:** Site visit, aircraft demonstration
4th week: **Lecture:** MAGNETISM — DIRECT-READING COMPASS AND FLUX VALVE, Earth's	5th week: **Lecture:** GYROSCOPIC INSTRUMENTS, Gyroscope: basic principles, Rate-of-turn

magnetic field, Aircraft magnetic field, Direct-reading magnetic compass, Flux valve **Practice:** Magnetism examples	indicator — Turn coordinator — Balance (slip) indicator, Attitude indicator (artificial horizon), Directional gyroscope, Remote-reading compass systems **Practice:** Lab demonstration
6th week: **Lecture:** INERTIAL NAVIGATION AND REFERENCE SYSTEMS (INS AND IRS), Inertial Navigation Systems (INS), Inertial Reference Systems (IRS), Basic principles, Design, Errors, accuracy, Operation, (strappeddown) **Practice:** System presentation	**7th week:** **Lecture:** AEROPLANE: AUTOMATIC FLIGHT CONTROL SYSTEMS, General: Definitions and control loops, Autopilot system: design and operation, Flight Director: design and operation, Aeroplane: Flight Mode Annunciator (FMA), Autoland: design and operation **Practice:** Site visit, simulator demonstration
8th week: 1st drawing week	
9th week: **Lecture:** TRIMS-YAW DAMPER — FLIGHT-ENVELOPE PROTECTION, Trim systems: design and operation, Yaw damper: design and operation, Flight-Envelope Protection (FEP) **Practice:** Operations example	**10th week:** **Lecture:** AUTO-THROTTLE-AUTOMATIC THRUST CONTROL SYSTEM, operation of an AT system, take-off/go-around;, climb or Maximum Continuous Thrust (MCT): N1 or EPR targeted; speed;, idle thrust; landing, control loop of an AT system **Practice:** Site visit, simulator demonstration
11th week: **Lecture:** COMMUNICATION SYSTEMS, Voice communication, data link transmission, Definitions and transmission modes, Future Air Navigation Systems (FANS), FLIGHT MANAGEMENT SYSTEM (FMS), Navigation database, aircraft database, Operations, limitations, Man–machine interface (Multifunction Control Display Unit (MCDU)) **Practice:** Site visit, simulator demonstration	**12th week:** **Lecture:** ALERTING SYSTEMS, PROXIMITY SYSTEMS, General, Flight Warning Systems (FWS), Stall Warning Systems (SWS), Stall protection, Ground-proximity warning systems (GPWS), Terrain-Avoidance Warning System (TAWS), Enhanced GPWS (EGPWS), ACAS/TCAS **Practice:** Case studies
13th week: **Lecture:** INTEGRATED INSTRUMENTS — ELECTRONIC DISPLAYS, Electronic display units, Mechanical integrated instruments: Attitude and Director Indicator (ADI)/Horizontal Situation Indicator (HSI), Electronic Flight Instrument Systems (EFIS), Primary Flight Display (PFD), Electronic	**14th week:** **Lecture:** MAINTENANCE, MONITORING AND RECORDING SYSTEMS, Cockpit Voice Recorder (CVR), Flight Data Recorders (FDR), Maintenance and monitoring systems, Integrated Health & Usage

Attitude Director Indicator (EADI), Navigation Display (ND), Electronic Flight Bag (EFB) **Practice:** Site visit, simulator demonstration	Monitoring System (IHUMS), Aeroplane Condition Monitoring System (ACMS) **Practice:** Case studies
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

Air Law (ATPL)

Code: MK3AIRLR04HX17-EN

ECTS Credit Points: 4

Evaluation: official exam

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): -

Further courses are built on it: No

Number of teaching hours/week (lecture + practice): 3+2

Topics:

The course teaches the comprehensive knowledge of Air Law to demonstrate a level that grants a succesfull authority examaccording to FCL.515 ATPL — Training course and theoretical knowledge examinations.

The course coversthe following main areas and give thorough information on:

Rules of the air, procedures for air navigation services: aircraft operations, air traffic services and air traffic management, aeronautical information service, aerodromes or

heliports, facilitation, search and rescue, security, aircraft accident and incident investigation, international law: conventions, agreements and organisations, airworthiness of aircraft, aircraft nationality and registration marks, personnel licensing

By conducting the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the legal bacnground and basis of aviation, learn the structure and sources of the rules.

Learning Objectives (LOs) published by the European Comission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Air Law, 2015, ISBN szám: 978 1 90620 264 4

Schedule

1st week Registration week	
2nd week:	3rd week:
Lecture: INTERNATIONAL LAW: CONVENTIONS, AGREEMENTS AND ORGANISATIONS, The Convention on International Civil Aviation (Chicago) — ICAO DOC 7300, Air navigation, The International Civil Aviation Organization (ICAO) Other conventions and agreements, World organisations, The International Air Transport Association (IATA) European organisations, European Aviation Safety Agency (EASA), EUROCONTROL, European Civil Aviation Conference (ECAC) Practice: Search practice in legislations	Lecture: AIRWORTHINESS OF AIRCRAFT, AIRCRAFT NATIONALITY AND REGISTRATION MARKS, ICAO Annex 8 and the related Certification Specifications Certificate of Airworthiness (CofA) Definitions of ICAO Annex 7, Aircraft nationality, common and registration marks to be used Practice: Case study in registration
4th week:	5th week:
Lecture: PERSONNEL LICENSING Regulation (EC) No 216/2008 (the Basic Regulation), Definitions, Applicability Part-FCL, Definitions, Content and structure, Commercial Pilot Licence (CPL), Airline Transport Pilot Licence (ATPL) and Multi-crew Pilot Licence (MPL), Ratings, Part-MED	Lecture: RULES OF THE AIR, Definitions of ICAO Annex 2, Applicability of the Rules of the Air, General rules, Visual Flight Rules (VFRs), Instrument Flight Rules (IFRs), Interception of civil aircraft Practice: Case study in rules of the air

ICAO Annex 1, Differences between ICAO Annex 1 and the Aircrew Regulation **Practice:** Methods in licensing, applications examples	
6th week:	**7th week:**
Lecture: PROCEDURES FOR AIR NAVIGATION SERVICES — AIRCRAFT OPERATIONS (PANS-OPS), Departure procedures,General criteria (assuming all engines operating), Standard instrument departures (SIDs),Omnidirectional departures, Approach procedures, Design, Arrival and approach segments, Missed approach, Visual manoeuvring (circling) in the vicinity of the aerodrome, Area Navigation (RNAV) approach procedures based on VOR/DME, Use of FMS/RNAV equipment to follow conventional non-precision approach procedures **Practice:** Examples in procedures	**Lecture:** PROCEDURES FOR AIR NAVIGATION SERVICES — AIRCRAFT OPERATIONS (PANS-OPS), Holding procedures, Entry and holding, Obstacle clearance (except table), Altimeter-setting procedures, Basic requirements and procedures, Procedures for operators and pilots, Secondary surveillance radar (transponder) operating procedures **Practice:** Examples in procedures
8th week: 1st drawing week	
9th week:	**10th week:**
Lecture: AIR TRAFFIC SERVICES AND AIR TRAFFIC MANAGEMENT, ICAO Annex 11 — Air Traffic Services, Definitions, Airspace, Air Traffic Control services, Flight Information Service (FIS), Alerting service, Principles governing RNP and ATS route designators, ICAO Document 4444-Air Traffic Management, Definitions, ATS system capacity and Air Traffic Flow Management (ATFM), ATC clearances, Horizontal speed control instructions, Change from IFR to VFR flight, Wake turbulence, Altimeter-setting procedures, Position reporting, Reporting of operational and meteorological information, Separation methods and minima **Practice:** Airport Tower visit, ATS system capacity calculations, requirements for different ATS systems	**Lecture:** AERONAUTICAL INFORMATION SERVICE, Introduction, Definitions of ICAO Annex 15, General, Integrated Aeronautical Information Package, Aeronautical Information Publication (AIP), NOTAMs, Aeronautical Information Regulation and Control (AIRAC), Aeronautical Information Circulars (AICs), Pre-flight and post-flight information/ data **Practice:** AIP, NOTAM examples
11th week:	**12th week:**

Lecture: AERODROMES (ICAO Annex 14, Volume I — Aerodrome Design and Operations), Aerodrome data, Aerodrome reference point, Pavement strengths, Declared distances, Physical characteristics, Runways, Runway strips, Runway-end safety area,Clearway,Stopway, Taxiways, Visual aids for navigation, Markings, Lights,Signs,Markers Aerodromes operational services, equipment and installations, Rescue and Firefighting (RFF), Apron management service, Ground-servicing of aircraft

Practice: Airport visit, planning examples, layout plan, master plan. Case study.

Lecture: FACILITATION (ICAO Annex 9)

General, Foreword, Definitions (ICAO Annex 9)

Entry and departure of aircraft, General Declaration, Entry and departure of crew, Entry and departure of passengers and baggage, Entry and departure of cargo

Practice: Facilitation examples

13th week:

Lecture: SEARCH AND RESCUE, Essential Search and Rescue (SAR) definitions in, ICAO Annex 12, Organisation, Operating procedures for non-SAR crews, Search and rescue signals

Practice: Case study.

14th week:

Lecture: SECURITY, Essential definitions of ICAO Annex 17, General principles, Organisation, Preventive security measures, Operators' security programme, Security procedures in other documents, i.e. ICAO Annex 2, ICAO Annex 6, ICAO Annex 14, ICAO Doc 4444

Practice: Airport visit, security procedures example, case study.

15th week: 2nd drawing week

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

Human Performance (ATPL)

Code: MK3HUMPR03HX17-EN

ECTS Credit Points: 3

Evaluation: official exam

Year, Semester: 2nd year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 3+2

Topics:

The course teaches the basic knowledge of Human Performance to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

The course covers the following main areas and give thorough information on:

Human factors: basic concepts, basic aviation physiology and health maintenance, basic aviation psychology, the circulatory system, oxygen and respiration, the eye and vision, flying and health, stress, behaviour and motivation, cognition in aviation, sleep and fatigue, communication and co -operation, man and machine, decision-making and risk

By conducting the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the complex knowledge of human physiology and health, risks, fatigue and decision making process under different flight conditions.

Learning Objectives (LOs) published by the European Comission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Human Performance and limitations, 2015, ISBN szám: 978 1 90620 271 2

Schedule

1st week Registration week	
2nd week: **Lecture:** HUMAN FACTORS: BASIC CONCEPTS, Human factors in aviation, Becoming a competent pilot **Practice:** Factors in training that ensures the future competency of the individual pilot	**3rd week:** **Lecture:** SAFETY, Accident statistics, Flight safety concepts, Safety culture **Practice:** Accident investigation studies
4th week: **Lecture:** BASICS OF FLIGHT PHYSIOLOGY, The atmosphere, Respiratory and circulatory system, High-altitude environment **Practice:** Site visit, demonstration of measurements for Respiratory and circulatory system	**5th week:** **Lecture:** MAN AND ENVIRONMENT, the sensory system, Central, peripheral and autonomic nervous systems, Vision, Hearing, Equilibrium, Integration of sensory inputs **Practice:** Site visit, demonstration of measurements for Central, peripheral and autonomic nervous systems, Vision, Hearing
6th week: **Lecture:** HEALTH AND HYGIENE, Personal hygiene, Body rhythm and sleep, Problem areas for pilots, Common minor ailments, Intoxication, Incapacitation in flight **Practice:** Case studies of sleep problems and incapacitation	**7th week:** **Lecture:** BASIC AVIATION PSYCHOLOGY, information processing, Attention and vigilance, Perception, Memory, Response selection Learning principles and techniques, Motivation **Practice:** Site visit, demonstration of measurements for Attention and vigilance, Perception, Memory, Response selection
8th week: 1st drawing week	
9th week: **Lecture:** HUMAN ERROR AND RELIABILITY, Reliability of human behaviour, Mental models and situation awareness, Theory and model of human error, Error generation **Practice:** Case studies	**10th week:** **Lecture:** DECISION-MAKING, Decision-making concepts, nature of bias and its influence on the decision-making process, relationship between risk assessment, commitment and pressure of time on decisionmaking strategies, general idea behind the creation of a model for decision-making; **Practice:** Decision making case studies
11th week:	**12th week:**

Lecture: AVOIDING AND MANAGING ERRORS, cockpit management, Safety awareness, Coordination (multi-crew concepts), Cooperation, Communication **Practice:** Site visit, coordination examples	**Lecture:** HUMAN BEHAVIOUR, Personality, attitude and behaviour, Individual differences in personality and motivation, Identification of hazardous attitudes (error proneness) **Practice:** Team work, presentation
13th week:	**14th week:**
Lecture: HUMAN OVERLOAD AND UNDERLOAD, Arousal, Stress, Fatigue and stress management **Practice:** Measurement techniques of fatigue	**Lecture:** ADVANCED COCKPIT AUTOMATION, advantages and disadvantages, Automation complacency, Working concepts **Practice:** Site visit, demonstration of automation
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

Flight Training I

Code: MK3FLT1R02HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+6

Topics and Scedule

The flying instruction is divided into five phases:

(1) phase 1: Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane including: (i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing; (ii) aerodrome and traffic pattern operations, collision avoidance and precautions; (iii) control of the aeroplane by external visual references; (iv) normal take-offs and landings; (v) flight at critically low air speeds, recognition of recovery from incipient and full stalls, spin avoidance; (vi) unusual attitudes and simulated engine failure.

(2) phase 2: Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including: (i) maximum performance (short field and obstacle clearance) takeoffs and short-field landings; (ii) flight by reference solely to instruments, including the completion of a 180 ° turn; (iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures; (iv) aerodrome and traffic pattern operations at different aerodromes; (v) crosswind take-offs and landings; (vi) abnormal and emergency procedures and manoeuvres, including simulated aeroplane equipment malfunctions; (vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology; (viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) phase 3: Exercises up to the VFR navigation progress test comprise a total of at least 5 hours of dual instruction and at least 40 hours as PIC. The dual instruction and testing up to the VFR navigation progress test comprise: (i) repetition of exercises of phases 1 and 2; (ii) VFR flight at relatively critical high air speeds, recognition of and recovery from spiral dives; (iii) VFR navigation progress test conducted by an FI not connected with the applicant's training; (iv) night flight time including take-offs and landings as PIC.

(4) phase 4: Exercises up to the instrument rating skill test comprise: (i) at least 55 hours instrument flight, which may contain up to 25 hours of instrument ground time in an FNPT I or up to 40 hours in an FNPT II or FFS which is conducted by an FI or an authorised SFI; (ii) 20 hours instrument time flown as SPIC; (iii) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan; (iv) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least: (A) transition from visual to instrument flight on take-off; (B) SIDs and arrivals; (C) en-route IFR procedures; (D) holding procedures; (E) instrument approaches to specified minima; (F) missed approach procedures; (G) landings from instrument approaches, including circling. (v) in-flight manoeuvres and specific flight characteristics; (vi) operation of an ME aeroplane in the exercises of (iv), including operation of the aeroplane solely by reference to instruments with one engine simulated inoperative, and engine shut-down and restart (the latter training is at a safe altitude unless carried out in an FSTD).

(5) phase 5: (i) instruction and testing in MCC comprisetherelevant training requirements; (ii) type rating training on Boeing 737 or Airbus 320.

Requirements

A, for a signature:

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Flight Training II

Code: MK3FLT2R02HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 2nd year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+5

Topics and Scedule

The flying instruction is divided into five phases:

(1) phase 1: Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane including: (i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing; (ii) aerodrome and traffic pattern operations, collision avoidance and precautions; (iii) control of the aeroplane by external visual references; (iv) normal take-offs and landings; (v) flight at critically low air speeds, recognition of recovery from incipient and full stalls, spin avoidance; (vi) unusual attitudes and simulated engine failure.

(2) phase 2: Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including: (i) maximum performance (short field and obstacle clearance) takeoffs and short-field landings; (ii) flight by reference solely to instruments, including the completion of a 180 ° turn; (iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures; (iv) aerodrome and traffic pattern operations at different aerodromes; (v) crosswind take-offs and landings; (vi) abnormal and emergency procedures and manoeuvres, including simulated aeroplane equipment malfunctions; (vii) operations to, from and transiting controlled aerodromes, compliance with ATS

procedures, R/T procedures and phraseology; (viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) phase 3: Exercises up to the VFR navigation progress test comprise a total of at least 5 hours of dual instruction and at least 40 hours as PIC. The dual instruction and testing up to the VFR navigation progress test comprise: (i) repetition of exercises of phases 1 and 2; (ii) VFR flight at relatively critical high air speeds, recognition of and recovery from spiral dives; (iii) VFR navigation progress test conducted by an FI not connected with the applicant's training; (iv) night flight time including take-offs and landings as PIC.

(4) phase 4: Exercises up to the instrument rating skill test comprise: (i) at least 55 hours instrument flight, which may contain up to 25 hours of instrument ground time in an FNPT I or up to 40 hours in an FNPT II or FFS which is conducted by an FI or an authorised SFI; (ii) 20 hours instrument time flown as SPIC; (iii) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan; (iv) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least: (A) transition from visual to instrument flight on take-off; (B) SIDs and arrivals; (C) en-route IFR procedures; (D) holding procedures; (E) instrument approaches to specified minima; (F) missed approach procedures; (G) landings from instrument approaches, including circling. (v) in-flight manoeuvres and specific flight characteristics; (vi) operation of an ME aeroplane in the exercises of (iv), including operation of the aeroplane solely by reference to instruments with one engine simulated inoperative, and engine shut-down and restart (the latter training is at a safe altitude unless carried out in an FSTD).

(5) phase 5: (i) instruction and testing in MCC comprise the relevant training requirements; (ii) type rating training on Boeing 737 or Airbus 320.

Requirements

A, for a signature:

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Flight Training III

Code: MK3FLT3R02HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 3rd year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+8

Topics and Scedule

The flying instruction is divided into five phases:

(1) phase 1: Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane including: (i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing; (ii) aerodrome and traffic pattern operations, collision avoidance and precautions; (iii) control of the aeroplane by external visual references; (iv) normal take-offs and landings; (v) flight at critically low air speeds, recognition of recovery from incipient and full stalls, spin avoidance; (vi) unusual attitudes and simulated engine failure.

(2) phase 2: Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including: (i) maximum performance (short field and obstacle clearance) takeoffs and short-field landings; (ii) flight by reference solely to instruments, including the completion of a 180 ° turn; (iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures; (iv) aerodrome and traffic pattern operations at different aerodromes; (v) crosswind take-offs and landings; (vi) abnormal and emergency procedures and manoeuvres, including simulated aeroplane equipment malfunctions; (vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology; (viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) phase 3: Exercises up to the VFR navigation progress test comprise a total of at least 5 hours of dual instruction and at least 40 hours as PIC. The dual instruction and testing up to the VFR navigation progress test comprise: (i) repetition of exercises of phases 1 and 2; (ii) VFR flight at relatively critical high air speeds, recognition of and recovery from spiral dives; (iii) VFR navigation progress test conducted by an FI not connected with the applicant's training; (iv) night flight time including take-offs and landings as PIC.

(4) phase 4: Exercises up to the instrument rating skill test comprise: (i) at least 55 hours instrument flight, which may contain up to 25 hours of instrument ground time in an FNPT I or up to 40 hours in an FNPT II or FFS which is conducted by an FI or an authorised SFI; (ii) 20 hours instrument time flown as SPIC; (iii) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan; (iv) procedures and manoeuvres for IFR operation under normal,

abnormal and emergency conditions covering at least: (A) transition from visual to instrument flight on take-off; (B) SIDs and arrivals; (C) en-route IFR procedures; (D) holding procedures; (E) instrument approaches to specified minima; (F) missed approach procedures; (G) landings from instrument approaches, including circling. (v) in-flight manoeuvres and specific flight characteristics; (vi) operation of an ME aeroplane in the exercises of (iv), including operation of the aeroplane solely by reference to instruments with one engine simulated inoperative, and engine shut-down and restart (the latter training is at a safe altitude unless carried out in an FSTD).

(5) phase 5: (i) instruction and testing in MCC comprise the relevant training requirements; (ii) type rating training on Boeing 737 or Airbus 320.

Requirements

A, for a signature:

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Flight Training IV

Code: MK3FLT4R02HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 3rd year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+8

Topics and Scedule

The flying instruction is divided into five phases:

(1) phase 1: Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane including: (i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing; (ii) aerodrome and traffic pattern operations, collision avoidance and precautions; (iii) control of the aeroplane by external

visual references; (iv) normal take-offs and landings; (v) flight at critically low air speeds, recognition of recovery from incipient and full stalls, spin avoidance; (vi) unusual attitudes and simulated engine failure.

(2) phase 2: Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including: (i) maximum performance (short field and obstacle clearance) takeoffs and short-field landings; (ii) flight by reference solely to instruments, including the completion of a 180 ° turn; (iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures; (iv) aerodrome and traffic pattern operations at different aerodromes; (v) crosswind take-offs and landings; (vi) abnormal and emergency procedures and manoeuvres, including simulated aeroplane equipment malfunctions; (vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology; (viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) phase 3: Exercises up to the VFR navigation progress test comprise a total of at least 5 hours of dual instruction and at least 40 hours as PIC. The dual instruction and testing up to the VFR navigation progress test comprise: (i) repetition of exercises of phases 1 and 2; (ii) VFR flight at relatively critical high air speeds, recognition of and recovery from spiral dives; (iii) VFR navigation progress test conducted by an FI not connected with the applicant's training; (iv) night flight time including take-offs and landings as PIC.

(4) phase 4: Exercises up to the instrument rating skill test comprise: (i) at least 55 hours instrument flight, which may contain up to 25 hours of instrument ground time in an FNPT I or up to 40 hours in an FNPT II or FFS which is conducted by an FI or an authorised SFI; (ii) 20 hours instrument time flown as SPIC; (iii) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan; (iv) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least: (A) transition from visual to instrument flight on take-off; (B) SIDs and arrivals; (C) en-route IFR procedures; (D) holding procedures; (E) instrument approaches to specified minima; (F) missed approach procedures; (G) landings from instrument approaches, including circling. (v) in-flight manoeuvres and specific flight characteristics; (vi) operation of an ME aeroplane in the exercises of (iv), including operation of the aeroplane solely by reference to instruments with one engine simulated inoperative, and engine shut-down and restart (the latter training is at a safe altitude unless carried out in an FSTD).

(5) phase 5: (i) instruction and testing in MCC comprise the relevant training requirements; (ii) type rating training on Boeing 737 or Airbus 320.

Requirements

A, for a signature:

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further

absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Flight Training V

Code: MK3FLT4R02HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 4th year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+12

Topics and Scedule

The flying instruction is divided into five phases:

(1) phase 1: Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane including: (i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing; (ii) aerodrome and traffic pattern operations, collision avoidance and precautions; (iii) control of the aeroplane by external visual references; (iv) normal take-offs and landings; (v) flight at critically low air speeds, recognition of recovery from incipient and full stalls, spin avoidance; (vi) unusual attitudes and simulated engine failure.

(2) phase 2: Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including: (i) maximum performance (short field and obstacle clearance) takeoffs and short-field landings; (ii) flight by reference solely to instruments, including the completion of a 180 ° turn; (iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures; (iv) aerodrome and traffic pattern operations at different aerodromes; (v) crosswind take-offs and landings; (vi) abnormal and emergency procedures and manoeuvres, including simulated aeroplane equipment malfunctions; (vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology; (viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) phase 3: Exercises up to the VFR navigation progress test comprise a total of at least 5 hours of dual instruction and at least 40 hours as PIC. The dual instruction and testing up to the VFR navigation progress test comprise: (i) repetition of exercises of phases 1 and 2; (ii) VFR flight at relatively critical high air speeds, recognition of and recovery from spiral dives; (iii) VFR navigation progress test conducted by an FI not connected with the applicant's training; (iv) night flight time including take-offs and landings as PIC.

(4) phase 4: Exercises up to the instrument rating skill test comprise: (i) at least 55 hours instrument flight, which may contain up to 25 hours of instrument ground time in an FNPT I or up to 40 hours in an FNPT II or FFS which is conducted by an FI or an authorised SFI; (ii) 20 hours instrument time flown as SPIC; (iii) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan; (iv) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least: (A) transition from visual to instrument flight on take-off; (B) SIDs and arrivals; (C) en-route IFR procedures; (D) holding procedures; (E) instrument approaches to specified minima; (F) missed approach procedures; (G) landings from instrument approaches, including circling. (v) in-flight manoeuvres and specific flight characteristics; (vi) operation of an ME aeroplane in the exercises of (iv), including operation of the aeroplane solely by reference to instruments with one engine simulated inoperative, and engine shut-down and restart (the latter training is at a safe altitude unless carried out in an FSTD).

(5) phase 5: (i) instruction and testing in MCC comprise the relevant training requirements; (ii) type rating training on Boeing 737 or Airbus 320.

Requirements

A, for a signature:

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Subject group "Field-Specific Professional Subjects"

Meteorology I (ATPL)

Code: MK3MET1R02HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 2nd year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 1+2

Topics:

The course (Part I and II together) teaches the basic knowledge of Meteorology to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

Part I of the course covers the following main areas and give thorough information on:

The atmosphere, pressure, density, pressure systems, synoptic charts, altimetry, temperature, humidity, adiabatics and stability, turbulence, wind, thermodynamics, clouds and fog, precipitation

By conducting both Part of the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the complex knowledge of meteorological conditions, different atmospheric structure and activities.

Learning Objectives (LOs) published by the European Comission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Meteorology, 2015, ISBN szám: 978 1 90620 272 9
- Sándor Valéria-Wantuch Ferenc, Repülésmeteorológia, 2005, ISBN szám: 963 7702 91 1

Schedule

1st week Registration week	
2nd week: **Lecture:** THE ATMOSPHERE, Composition, extent, vertical division of the atmosphere, Air temperature, Definition and units, Vertical distribution of temperature, Transfer of heat, ICAO Standard Atmosphere (ISA), Altimetry, Terminology and definitions, Altimeter settings, Calculations, Effect of accelerated airflow due to topography **Practice:** Calculation examples	3rd week: **Lecture:** WIND, Definition and measurement of wind, Primary cause of wind, pressure gradient, Coriolis force, gradient wind, Variation of wind in the friction layer, Effects of convergence and divergence, General global circulation **Practice:** Wind gradient calculations
4th week:	5th week:

Lecture: WIND, Local winds, Anabatic and katabatic winds, mountain and valley winds, Venturi effects, land and sea breezes, Mountain waves (standing waves, lee waves), Origin and characteristics **Practice:** Case studies on wind	**Lecture:** WIND, Turbulence, Description and types, Formation and location of turbulence, Clear-Air Turbulence (CAT): Description, cause and location, Jet streams, Description, Formation and properties of jet streams, Location of jet streams and associated CAT areas, Jet stream recognition **Practice:** Case studies on wind
6th week: **Lecture:** THERMODYNAMICS, Humidity, Water vapour in the atmosphere, Mixing ratio, Temperature/dew point, relative humidity, Change of state of aggregation, Condensation, evaporation, sublimation, freezing and melting, latent heat, Adiabatic processes, Adiabatic processes, stability of the atmosphere **Practice:** Case studies on thermodynamics	**7th week:** **Lecture:** CLOUDS AND FOG, Cloud formation and description, Cloud types and cloud classification, Influence of inversions on cloud development, Flying conditions in each cloud type **Practice:** Classification examples
8th week: 1st drawing week	
9th week: **Lecture:** CLOUDS AND FOG, Fog, mist, haze, General aspects, Radiation fog, Advection fog, Steam fog, Frontal fog, Orographic fog (hill fog) **Practice:** Case studies on clouds and fog	**10th week:** **Lecture:** PRECIPITATION, Development of precipitation, Types of precipitation, relationship with cloud types **Practice:** Airport meteorological center site visit
11th week: **Lecture:** AIR MASSES AND FRONTS, Air masses, Description, classification and source regions of air masses, Modifications of air masses **Practice:** Case studies on air masses and fronts	**12th week:** **Lecture:** AIR MASSES AND FRONTS, Fronts, General aspects, Warm front, Cold front, Warm sector associated clouds and weather, Weather behind the cold front **Practice:** Case studies on air masses and fronts
13th week: **Lecture:** AIR MASSES AND FRONTS, Occlusions, associated clouds and weather, Stationary front, associated clouds and weather, Movement of fronts and pressure systems, life cycle, Changes of meteorological elements at a frontal wave	**14th week:** **Lecture:** PRESSURE SYSTEMS, principal pressure areas, Location of the principal pressure areas, Anticyclone, types, general properties, cold and warm anticyclones, ridges and wedges, subsidence, Non-frontal depressions, Thermal, orographic,

Practice: Case studies on air masses and fronts	polar and secondary depressions; troughs, Tropical revolving storms, **Practice:** Case studies on storms
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Meteorology II (ATPL)

Code: MK3MET1R02HX17-EN

ECTS Credit Points: 2

Evaluation: official exam

Year, Semester: 3rd year, 1st semester

Its prerequisite(s): Meteorology I

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+3

Topics:

The course (Part I and II together) teaches the basic knowledge of Meteorology to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

Part II of the course covers the following main areas and give thorough information on:

Visibility, icing, air masses and fronts, documentation, weather and wind charts, area route climatology, flight hazards, meteorological information, metars, tafs, warning messages

By conducting both Part of the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the

complex knowledge of meteorological conditions, different atmospheric structure and activities.

Learning Objectives (LOs) published by the European Comission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Meteorology, 2015, ISBN szám: 978 1 90620 272 9
- SándorValéria-WantuchFerenc, Repülésmeteorológia, 2005, ISBN szám: 963 7702 91 1

Schedule

1st week Registration week	
2nd week: **Lecture:** CLIMATOLOGY, Climatic zones, General circulation in the troposphere and lower stratosphere, Climatic classification **Practice:** Climatic classification examples	3rd week: **Lecture:** CLIMATOLOGY, Tropical climatology, Cause and development of tropical showers and thunderstorms: humidity, temperature, tropopause, Seasonal variations of weather and wind, typical synoptic situations **Practice:** Intertropical Convergence Zone (ITCZ), general seasonal movement, Monsoon, sandstorms, cold-air outbreaks, Easterly waves
4th week: **Lecture:** CLIMATOLOGY, Typical weather situations in the mid-latitudes, Westerly situation (westerlies), High-pressure area, Flat-pressure pattern, Cold-air pool (cold-air drop), Local winds and associated weather **Practice:** Foehn, Mistral, Bora, Scirocco, Ghibli and Khamsin, Harmattan	5th week: **Lecture:** FLIGHT HAZARDS, Icing, Conditions for ice accretion, Types of ice accretion, Hazards of ice accretion, avoidance, Turbulence, Effects on flight, avoidance, Clear-Air Turbulence (CAT): effects on flight, avoidance **Practice:** Case study, avoidance techniques
6th week: **Lecture:** FLIGHT HAZARDS, Wind shear, Definition of wind shear, Weather	7th week: **Lecture:** FLIGHT HAZARDS, Thunderstorms, Conditions for and process of development,

conditions for wind shear, Effects on flight, avoidance **Practice:** Case study, avoidance techniques	forecast, location, type specification, Structure of thunderstorms, life history, Electrical discharges, Development and effects of downbursts **Practice:** Thunderstorm avoidance, Tornadoes, Properties and occurrence
8th week: 1st drawing week	
9th week: **Lecture:** FLIGHT HAZARDS, Inversions, Influence on aircraft performance, Stratospheric conditions, Influence on aircraft performance **Practice:** Aircraft performance influence examples	**10th week:** **Lecture:** FLIGHT HAZARDS, Hazards in mountainous areas, Influence of terrain on clouds and precipitation, frontal passage, Vertical movements, mountain waves, wind shear, turbulence, ice accretion, Development and effect of valley inversions, Visibility-reducing phenomena **Practice:** Reduction of visibility caused by precipitation and obscurations, Reduction of visibility caused by other phenomena
11th week: **Lecture:** METEOROLOGICAL INFORMATION, Observation, Surface observations, Radiosonde observations, Satellite observations, Weather-radar observations, Aircraft observations and reporting **Practice:** Airport meteorological center site visit	**12th week:** **Lecture:** METEOROLOGICAL INFORMATION, Weather charts, Significant weather charts, Surface charts, Upper-air charts **Practice:** Charts examples
13th week: **Lecture:** METEOROLOGICAL INFORMATION, Information for flight planning, Aviation weather messages, Meteorological broadcasts for aviation, Use of meteorological documents, Meteorological warnings **Practice:** Aviation weather messages examples	**14th week:** **Lecture:** METEOROLOGICAL INFORMATION, Meteorological services, World area forecast system and meteorological offices, International organisations **Practice:** Meteorological offices in operation
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory.

Participation at practice classes is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

Type Rating

Code: MK3CREWR04HX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 4th year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+3

Topics:

The course teaches the basic knowledge of Multi-crew cooperation according to FCL.735.A; AMC1 FCL.930.MCCI

The course covers the following main areas and give thorough information on:

Displays, practical examples for softwares, hardware, environment, malfunctions in crew cooperation, leadership; tasks and privileges, cultural elements, pf and pm tasks, professional quality, responsible crew cooperation, personal characteristics, attitude and devotion: attention, conflict solving skill, intervention, effective and clear communication in flight, crew cooperation procedures, use of checklists

By conducting the course the student will have the knowledge recommended by the EU legislation FCL.735.A and AMC1 FCL.930.MCCI will understand the complex requirements of multi crew cooperation with it's compulsory set of operational and human skills.

Literature:

Compulsory:

- O'Connor, P., Hormann, H., Flin, R., Lodge, M. & Goeters, K. (2002). Developing a method for evaluating crew resource management: a European perspective. The International Journal of Aviation Psychology, 12, 263-285.
- Mearns, K., Flin, R. & O'Connor, P. (2001). Sharing worlds of risk; improving communication with crew resource management. Journal of Risk Research, 4, 377-392.
- Crew Resource Management: A Literature Review Robert W. Kaps Ran Keren-Zvi Jose R. Ruiz. Volume 8 Number 3 JAAER Spring 1999. Journal of Aviation/Aerospace Education & Research.

Schedule

1st week Registration week	
2nd week: Practice: general, SOP, task sharing, cross check information, general callouts and crew coordination, abbreviation, conversations, callouts for deviations, relevant speeds, setting of speed indicators, using VHF-radio, normal and abnormal operation of aircraft systems, use of checklists	3rd week: Practice: Pre-flight preparation, Take-off data sheet, briefing before take-off, before take-off checks including powerplant checks, safety preparations before take-off, normal start-up cooperation, taxi cooperation and callouts
4th week: Practice: Pre-flight preparation, FMS initialization, radio and navigation equipment preparation, flight documentation, computation of take-off performance data	5th week: Practice: take-off, normal take-off and climb cooperation and callouts, normal take-offs with different flap settings, setting of altimeters, Take-off and climb, normal takeoffs
6th week: Practice: take-off, rejected takeoffs, take-offs with abnormal and emergency situations included, rejected take-offs; crosswind take-offs; take-offs at maximum take-off mass; engine failure after v1	7th week: Practice: Cruse, normal cruise cooperation and callouts, flying in turbulence, holding, icing emergency descent, early recognition of and reaction on approaching stall in differing aircraft configurations
8th week: 1st drawing week	
9th week: Practice: approach, cooperation and callouts, briefing before landing, descent cooperation and callouts, descent	10th week: Practice: approach, precision approach using raw data, precision approach using

techniques, descent and approach, instrument flight procedures, holding	flight director, precision approach using autopilot, one-engine inoperative approach
11th week:	12th week:
Practice: approach, non-precision and circling approaches, computation of approach and landing data, approach in low visibility conditions	Practice: go around, all engines go around, go-around with one engine inoperative, go-around cooperation and callouts, wind shear during approach
13th week:	14th week:
Practice: landing, cooperation and callouts, landings, normal, crosswind and with one engine simulated inoperative, transition from instrument to visual flight on reaching decision altitude or height or minimum descent altitude or height	Practice: emergency situations, type of pilot incapacitation, partial and full, recognition of the signs of incapacitation, actions to be taken by incapacitation, emergency and abnormal procedures, emergency descent, after landing and post flight procedures
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Radiotelephony

Code: MK3RADTR02HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 4th year, 1st semester

Its prerequisite(s): Radionavigation

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 0+1

Topics:

Radiotelephony subject contains supplementary information in addition to VFR and IFR communication ATPL subjects that fills the gap between theoretical knowledge and practical use of radiotelephony during actual flight operation.

The course covers the following main areas and give thorough information on:

Differences between certain countries, continents (content of atis, atc clearance, communication with ground staff and atc), types of operation (business jet, passenger flight, cargo flight, etops).

The course is not an obligation by the Part-FCL regulation nevertheless it is prepared to give a more comprehensive view for the pilot of the future to understand more deeply the correlations in aviation.

It is aimed to contribute to the achievement of safe flight during their proposed pilot career. It is crucial that a pilot could be able to recognize the hazard and apply for the well-known procedures in this matter during a flight.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Communications, 2015, ISBN szám: 978 1 90620 277 4

Schedule

1st week Registration week	
2nd week: **Practice:** General Procedures, Use of VHF RTF Channels, Transmitting Technique, Transmission of Letters, of Time, Standard Words and Phrases, Callsigns, Continuation of Communications, Corrections and Repetitions, Clearance Issue and Read-back Requirements, Communication Failure, Record of Communications, Categories of Message	**3rd week:** **Practice:** General Phraseology, Level Reporting, Speed Control, Initial Call – IFR/VFR flights, Position Reporting, Flight Plans, Low Visibility Procedures, Delays
4th week: **Practice:** Aerodrome Phraseology, Aerodrome Control Service Phraseology, Type of Service, Departure Information and Engine Starting Procedures, Pushback and Powerback, Taxi Instructions, Pre-Departure Manoeuvring, Take-Off Clearance, Final Approach and Landing, Missed Approach, Runway Vacating and	**5th week:** **Practice:** Aerodrome Phraseology, Aerodrome Flight Information Service Phraseology, AFIS Phraseology for Ground Movement, Take-Off, Landing and Transit, RNAV (GNSS) Instrument Approach Procedures, Initial Call, Position Reporting, Traffic Information, Final Approach Fix, Inbound / Outbound Aircraft Interaction, Reporting GNSS Problems

Communicating after Landing Essential Aerodrome Information	
6th week: **Practice:** Aerodrome Phraseology, Aerodrome Phraseology for Vehicles (ATC and AFIS only), Movement Instructions, To Cross a Runway, Low Visibility Procedures, Messages Regarding Safety of an Aircraft and Regarding Wildlife, Broken-down Vehicle, Radio Failure	**7th week:** **Practice:** Aerodrome Phraseology, Aerodrome Air/Ground Communication Service Phraseology, Type of Service, Air/Ground Station Identification, Offshore Communication Service
8th week: 1st drawing week	
9th week: **Practice:** Radar Phraseology, Radar Identification of Aircraft, Secondary Surveillance Radar Phraseology, ATS Surveillance Service, Radar Vectoring, Traffic Information and Avoiding Action Phraseology, ACAS/TCAS Phraseology, Communications and Loss of Communications, Danger Area Crossing Service/Danger Area Activity	**10th week:** **Practice:** Approach Phraseology, Approach Control Service Phraseology, IFR Departures, VFR Departures, IFR Arrivals, VFR Arrivals, Special VFR Flights, Vectoring to Final Approach, Direction Finding (DF), VDF Procedure, NDB(L) and VOR Procedures, Area Navigation Global Navigation Satellite System RNAV(GNSS) Phraseology, Procedure Clearance
11th week: **Practice:** Approach Phraseology, Position Reporting, Final Approach Fix, Reporting GNSS Problems, Surveillance Radar Approach (SRA), Clearance to enter Control Zones (CTR), Reduced Traffic Information, Traffic Service – Operations below ATC Terrain Safety Levels, Deconfliction Service – Departing and Arriving Aircraft	**12th week:** **Practice:** Area Phraseology, Area Control Service Phraseology, Position Reporting, Flights Joining Airways, Flights Transitioning Between Different Classifications of Controlled Airspace, Flights Leaving Airways, Flights Crossing Airways, Flights Holding En-Route, Reduced Vertical Separation Minimum (RVSM) Phraseology
13th week: **Practice:** Emergency Phraseology, Distress and Urgency Communication Procedures, States of Emergency, UHF and VHF Emergency Service General Procedures, Emergency Message, PAN PAN MEDICAL, Ejection from Aircraft, Speechless Code, Radio Procedures – Practice Emergencies, Relayed Emergency Message, Emergency Descent, Fuel Shortage, Termination of Distress Communications and Imposition of Silence	**14th week:** **Practice:** Miscellaneous Phraseology, Wake Turbulence, 8.33 kHz Phraseology, Aerodrome Emergency Services, Radio Mandatory Zones

15th week: 2nd drawing week

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends in mid-semester grade based on the assessment of the instructor.

Mass and Balance (ATPL)

Code: MK3MASSR03HX17-EN

ECTS Credit Points: 3

Evaluation: official exam

Year, Semester: 3rd year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 2+2

Topics:

The course teaches the basic knowledge of Mass and Balance to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

The course covers the following main areas and give thorough information on:

Purpose of mass and balance considerations, loading, fundamentals of cg calculations, mass and balance details of aircraft, determination of cg position, general principles take off, climb and descent, general principles landing, single engine, multi-engined class b take off, climb, cruise, landing, class a aircraft take off, additional take off procedures, take off climb, en route, landing, cargo handling

By conducting the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the legal bacnground and basis of aviation, learn the structure and sources of the rules.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK),Mass and Balance - Performance, 2015, ISBN szám: 978 1 90620 269 9

Schedule

1st week Registration week	
2nd week: Lecture: PURPOSE OF MASS-AND-BALANCE CONSIDERATIONS, limitations, Importance with regard to structural limitations, Importance with regard to performance, Centre-of-gravity (CG) limitations, Importance with regard to stability and controllability, Importance with regard to performance Practice: Stability calculation	3rd week: Lecture: LOADING, Terminology, Mass terms, Load terms (including fuel terms), Mass limits, Structural limitations, Performance limitations,-compartment limitations Practice: Documentation examples
4th week: Lecture: LOADING, Mass calculations, Maximum masses for take-off and landing, traffic load and fuel load, Use of standard masses for passengers, baggage and crew Practice: Mass calculation examples	5th week: Lecture: FUNDAMENTALS OF CENTRE-OF-GRAVITY CALCULATIONS, Definition of Centre of Gravity (CG), Conditions of equilibrium (balance of forces and balance of moments) Practice: Basic calculations of CG
6th week: Lecture: MASS-AND-BALANCE DETAILS OF AIRCRAFT, Contents of mass-and-balance documentation, Datum, moment arm, CG position as distance from datum, CG position as percentage of Mean Aerodynamic Chord (% MAC), Longitudinal-, Lateral CG limits, passenger and cargo compartments, fuel system relevant to mass-and balance considerations Practice: Airport visit, demonstration of compartments, fuel system	7th week: Lecture: MASS-AND-BALANCE DETAILS OF AIRCRAFT, Determination of aircraft empty mass and CG position by weighing, Weighing of aircraft (general aspects) Practice: Calculation of mass and CG position of an aircraft using weighing data
8th week: 1st drawing week	

9th week:	10th week:
Lecture: MASS-AND-BALANCE DETAILS OF AIRCRAFT, Extraction of basic empty mass and CG data from aircraft documentation, Basic empty mass (BEM) and/or dry operating mass (DOM), CG position and/or moment at BEM/DOM, Deviation from standard configuration Practice: Documentation examples	Lecture: DETERMINATION OF CG POSITION, Methods, Arithmetic method, Graphic method, Index method Practice: Methods examples
11th week:	12th week:
Lecture: DETERMINATION OF CG POSITION, Load and trim sheet, General considerations Practice: Load and trim sheet examples, case studies	Lecture: DETERMINATION OF CG POSITION, Load sheet and CG envelope for light aeroplanes and for helicopters Practice: Load and trim sheet examples, case studies
13th week:	14th week:
Lecture: DETERMINATION OF CG POSITION Load sheet for large aeroplanes, Trim sheet for large aeroplanes, Last-minute changes, Repositioning of CG by shifting the load, by additional load or ballast Practice: Load and trim sheet examples, case studies	Lecture: CARGO HANDLING, Types of cargo (general aspects), Floor-area load and running-load limitations in cargo compartments, Securement of load Practice: Airport visit, handling demonstration
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

Performance (ATPL)

Code: MK3PERFR04HX17-EN

ECTS Credit Points: 4

Evaluation: official exam

Year, Semester: 3rd year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 3+3

Topics:

The course teaches the basic knowledge of Performance to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

The course covers the following main areas and give thorough information on:

Performance Class B: SE aeroplanes, performance Class B: ME aeroplanes, performance Class A : aeroplanes certificated under CS-25 only

By conducting the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the legal background and basis of aviation, learn the structure and sources of the rules.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK),Mass and Balance - Performance, 2015, ISBN szám: 978 1 90620 269 9

Schedule

1st week Registration week	
2nd week: **Lecture:** GENERAL, Performance legislation, Airworthiness requirements according to CS-23 and CS-25, Operational regulations, General performance theory, Stages of flight, Definitions, terms and concepts, Variables influencing performance **Practice:** Airworthiness and operations requirements interpretation examples	**3rd week:** **Lecture:** PERFORMANCE CLASS B-SINGLE-ENGINE AEROPLANES, Definitions of speeds used, Effect of variables on single-engine aeroplane performance, Take-off and landing **Practice:** effects of flap-setting on the ground-roll distance, effects of the different recommended power settings on range and endurance
4th week:	**5th week:**

Lecture: PERFORMANCE CLASS B-SINGLE-ENGINE AEROPLANES, Climb, cruise and descent, Use of aeroplane performance data, Take-off, Climb, Cruise, Landing **Practice:** Performance data examples for single engine aeroplanes	**Lecture:** PERFORMANCE CLASS B-MULTI-ENGINE AEROPLANES, Definitions of terms and speeds, Effect of variables on multi-engine aeroplane performance, Take-off and landing, Climb, cruise and descent, Landing **Practice:** Performance data examples for multi engine aeroplanes
6th week: **Lecture:** PERFORMANCE CLASS B-MULTI-ENGINE AEROPLANES, Use of aeroplane performance data, Take-off, Climb, Cruise and descent, Landing **Practice:** Performance data examples	**7th week:** **Lecture:** PERFORMANCE CLASS A-AEROPLANES CERTIFIED ACCORDING TO CS-25 ONLY, Take-off, Definitions of terms used, Take-off distances, Accelerate-stop distance **Practice:** Distance calculations
8th week: 1st drawing week	
9th week: **Lecture:** PERFORMANCE CLASS A, Balanced field length concept, Unbalanced field length concept, Runway Length-Limited Take-Off Mass (RLTOM), Take-off climb, Obstacle-limited take-off **Practice:** Concept examples	**10th week:** **Lecture:** PERFORMANCE CLASS A, Climb, Climb techniques, Influence of variables on climb performance, Use of aeroplane flight data **Practice:** Climb examples
11th week: **Lecture:** PERFORMANCE CLASS A, Cruise, Cruise techniques, Maximum endurance, Maximum range, Long-range cruise, Influence of variables on cruise performance, Cruise altitudes, Cost Index (CI),Use of aeroplane flight data **Practice:** Cruise techniques examples	**12th week:** **Lecture:** PERFORMANCE CLASS A, En route one engine inoperative, Drift down, Influence of variables on the en route one engine inoperative performance **Practice:** Determination of en route flight path data, speed during drift down
13th week: **Lecture:** PERFORMANCE CLASS A, Descent, Descent techniques, Influence of variables on descent performance, Use of aeroplane flight data **Practice:** Descent techniques examples	**14th week:** **Lecture:** PERFORMANCE CLASS A, Approach and landing, Approach requirements, Landing field-length requirement, Influence of variables on landing performance, Quick turnaround limit, Use of aeroplane flight data **Practice:** Effect of temperature and pressure altitude on approach and landing-

	climb performance, landing distance calculations

15th week: 2nd drawing week

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

Flight Planning and Monitoring (ATPL)

Code: MK3FLPMR03HX17-EN

ECTS Credit Points: 3

Evaluation: official exam

Year, Semester: 2nd year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 4+2

Topics:

The course teaches the basic knowledge of Flight Planning and Monitoring to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

The course covers the following main areas and give thorough information on:

Air information publications, topographical chart, weather chartsflight planning for VFR flights, flight planning for IFR flights, fuel planning, pre-flight preparation, ATS flight plan, flight monitoring and in-flight re-planning, point of no safe return, critical point gp-equal time point

By conducting the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the legal bacnground and basis of aviation, learn the structure and sources of the rules.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), FlightPlanning and Monitoring, 2015, ISBN szám: 978 1 90620 270 5

Schedule

1st week Registration week	
2nd week: Lecture: FLIGHT PLANNING FOR VFR FLIGHTS, VFR navigation plan, Routes, airfields, heights and altitudes from VFR charts, Courses and distances from VFR charts Practice: VFR planning examples	3rd week: Lecture: FLIGHT PLANNING FOR VFR FLIGHTS, Aerodrome charts and aerodrome directory, Communications and radio-navigation planning data Practice: Completion of navigation plan VFR flights
4th week: Lecture: FLIGHT PLANNING FOR IFR FLIGHTS, IFR navigation plan, Airways and routes, Courses and distances from en route charts, Altitudes, Standard Instrument Departures (SIDs) and Standard Arrival Routes (STARs) Practice: IFR planning examples	5th week: Lecture: FLIGHT PLANNING FOR IFR FLIGHTS, Instrument-approach charts, Communications and radio-navigation planning data Practice: Completion of navigation plan IFR flights
6th week: Lecture: FUEL PLANNING, General, Pre-flight fuel planning for commercial flights, Taxiing fuel, Trip fuel, Reserve fuel and its components, Extra fuel, Calculation of total fuel and completion of the fuel section of the navigation plan (fuel log) Practice: Fuel calculation examples	7th week: Lecture: FUEL PLANNING, Specific fuel-calculation procedures, Decision-point procedure, Isolated-aerodrome procedure, Predetermined point procedure,Fuel-tankering, Isolated-heliport procedure Practice: Procedure examples, case studies
8th week: 1st drawing week	
9th week: Lecture: PRE-FLIGHT PREPARATION, NOTAM briefing, Ground facilities and services, Departure, destination and	10th week: Lecture: PRE-FLIGHT PREPARATION, Meteorological briefing, Extraction and analysis of relevant data from meteorological documents, Extraction and

alternate aerodromes, Airway routings and airspace structure **Practice:** NOTAM examples, case studies	analysis of relevant data from meteorological documents, Update of navigation plan using the latest meteorological information,Update of mass and balance, performance data, fuel log **Practice:** Meteorological briefing examples, case studies
11th week: **Lecture:** PRE-FLIGHT PREPARATION, Point of Equal Time (PET) and Point of Safe Return (PSR), Point of Equal Time (PET), Point of Safe Return (PSR) **Practice:** Team work, case presentation	**12th week:** **Lecture:** ICAO FLIGHT PLAN (ATS Flight Plan), Individual Flight Plan, Format of Flight Plan, Completion of an ATS Flight Plan (FPL), Repetitive Flight Plan, Submission of an ATS Flight Plan (FPL) **Practice:** Airport Tower visit, Flight Plan examples
13th week: **Lecture:** FLIGHT MONITORING AND IN-FLIGHT REPLANNING, Flight monitoring, Monitoring of track and time, In-flight fuel management, Monitoring of primary flight parameters, In-flight replanning in case of deviation from planned data **Practice:** Case studies	**14th week:** **Lecture:** FLIGHT MONITORING AND IN-FLIGHT REPLANNING II, Flight monitoring, In-flight replanning in case of deviation from planned data **Practice:** Case studies
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

General Navigation (ATPL)

Code: MK3GENAR04HX17-EN

ECTS Credit Points: 4

Evaluation: official exam

Year, Semester: 3rd year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 3+4

Topics:

The course teaches the basic knowledge of General Navigation to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

The course covers the following main areas and give thorough information on:

Basics of navigation, magnetism and compasses, charts, dead reckoning navigation, in-flight navigation, direction latitude and longitude, great circles rhumb lines, the vector triangle, topographical maps, pilot navigation, wind components, convergency and conversion angle, departure, scale, charts, general navigation problems, gyroscopes, the direct indicating compass, remote indicating compass, flight management systems, area navigation systems

By conducting the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the legal bacnground and basis of aviation, learn the structure and sources of the rules.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), General Navigation, 2015, ISBN szám: 978 1 90620 273 6

Schedule

1st week Registration week	
2nd week:	**3rd week:**
Lecture: BASICS OF NAVIGATION, The solar system, Earth's orbit, seasons and apparent movement of the sun, The Earth, rhumb line, Convergency, conversion angle, Latitude, difference of latitude, Longitude, difference of longitude	**Lecture:** BASICS OF NAVIGATION, Time and time conversions, Apparent time, Universal Time Coordinated (UTC), Local Mean Time (LMT), Standard times (STs), Dateline, Determination of sunrise (SR), sunset (SS) and civil twilight

Practice: Great circle, small circle, Use of latitude and longitude coordinates to locate any specific position	**Practice:** Time conversion examples
4th week:	**5th week:**
Lecture: BASICS OF NAVIGATION, True north, Terrestrial magnetism: magnetic north, inclination and variation, Compass deviation, compass north, Isogonals, relationship between true and magnetic north, Gridlines, isogrives **Practice:** True and magnetic north examples	**Lecture:** BASICS OF NAVIGATION, Distance, Units of distance and height used in navigation: nautical miles, statute miles, kilometres, metres, feet, Conversion from one unit to another, Relationship between nautical miles and minutes of latitude and minutes of longitude **Practice:** Distance and height coversion examples
6th week:	**7th week:**
Lecture: MAGNETISM AND COMPASSES, Knowledge of the principles of the direct-reading (standby) compass, The use of this compass, Serviceability tests, Situations requiring a compass swing **Practice:** Compass instrument demonstration	**Lecture:** CHARTS, General properties of miscellaneous types of projections, representation of meridians, parallels, great circles and rhumb lines, Direct Mercator, Lambert conformal conic, Polar stereographic **Practice:** Example on charts, reading
8th week: 1st drawing week	
9th week:	**10th week:**
Lecture: CHARTS, The use of current aeronautical charts, Plotting positions, Methods of indicating scale and relief, Conventional signs, Measuring tracks and distances, Plotting bearings **Practice:** Example on charts, measuring	**Lecture:** DEAD RECKONING (DR) NAVIGATION, Basis of dead reckoning, Track, Heading (compass, magnetic, true, grid), Wind velocity, Airspeed (IAS, CAS, TAS, Mach number), Ground speed,ETA, Drift, wind correction angle, Use of the navigational computer,Speed, Time, Distance, Fuel consumption, Conversions, Airspeed, Wind velocity, True altitude, The triangle of velocities **Practice:** Track examples, calculations
11th week:	**12th week:**
Lecture: DEAD RECKONING (DR) NAVIGATION, Determination of DR position, Confirmation of flight progress (DR), Lost procedures, Measurement of DR elements, Calculation of altitude, adjustments, corrections, errors,	**Lecture:** IN-FLIGHT NAVIGATION, Use of visual observations and application to inflight navigation, Navigation in climb and descent, Average airspeed, Average wind velocity (WV), Ground speed/distance

Determination of temperature, Determination of appropriate speed, Determination of Mach number **Practice:** Calculation examples	covered during climb or descent, Gradients versus rate of climb/descent **Practice:** Calculation examples
13th week: **Lecture:** IN-FLIGHT NAVIGATION, Navigation in cruising flight, use of fixes to revise navigation data, Off-track corrections, Calculation of wind speed and direction, Estimated Time of Arrival (ETA) revisions **Practice:** Case studies for in-flight navigation	**14th week:** **Lecture:** IN-FLIGHT NAVIGATION, Flight log **Practice:** Flight log examples
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

Radio Navigation (ATPL)

Code: MK3RANAR04HX17-EN

ECTS Credit Points: 4

Evaluation: official exam

Year, Semester: 3rd year, 1st semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 3+4

Topics:

The course teaches the basic knowledge of Radio Navigation to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

The course covers the following main areas and give thorough information on:

Basic radio propagation theory, radio aids, radar, doppler radar, VDF, NBD and ADF, VOR, ILS, MLS, ground ATC radar, airborne weather radar, secondary surveillance radar, DME area navigation systems and RNAV or FMS, GNSS

By conducting the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the legal bacnground and basis of aviation, learn the structure and sources of the rules.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Radio Navigation, 2015, ISBN szám: 978 1 90620 274 3

Schedule

1st week Registration week	
2nd week: **Lecture:** BASIC RADIO PROPAGATION THEORY, Basic principles, Electromagnetic waves, Frequency, wavelength, amplitude, phase angle, Frequency bands, sidebands, Pulse characteristics, Carrier, modulation, Kinds of modulation (amplitude, frequency, pulse, phase) **Practice:** Lab demonstration	3rd week: **Lecture:** RADIO AIDS, Ground D/F, Non-Directional Beacon (NDB)/ Automatic Direction Finder (ADF), Principles, Presentation and interpretation, Coverage and range, Errors and accuracy, Factors affecting range and accuracy **Practice:** Site visit, NDB/ADF demonstration
4th week: **Lecture:** RADIO AIDS, VOR and Doppler VOR, DME, Landing System (MLS), Principles,Presentation and interpretation, Coverage and range, Error and accuracy, Factors affecting range and accuracy **Practice:** Site visit, DME demonstration	5th week: **Lecture:** BASIC RADIO PROPAGATION THEORY, Antennas, Characteristics, Polarisation, Types of antennas, Wave propagation, Structure of the ionosphere, Ground waves, Propagation with the frequency bands, Doppler principle, Factors affecting propagation **Practice:** Lab demonstration
6th week: **Lecture:** RADAR, Pulse techniques and associated terms, Ground radar, Principles	7th week: **Lecture:** RADAR, Airborne weather radar, Principles, Secondary surveillance radar

Practice: Presentation and interpretation	and transponder, Principles, Modes and codes, , Errors and accuracy **Practice:** Presentation and interpretation
8th week: 1st drawing week	
9th week: **Lecture:** AREA NAVIGATION SYSTEMS, RNAV/FMS, General philosophy and definitions, Basic RNAV (B-RNAV), Precision RNAV (P-RNAV), RNP-PNAV, Principles of 2D RNAV, 3D RNAV and 4D RNAV, Required Navigation Performance (RNP) in accordance with ICAO Doc 9613 **Practice:** RNAV examples	**10th week:** **Lecture:** AREA NAVIGATION SYSTEMS, Simple 2D RNAV, Flight-deck equipment, Navigation computer, VOR/DME navigation, Navigation computer input/output, 4D RNAV, Flight-deck equipment, Navigation computer, VOR/DME navigation, Navigation computer input/output **Practice:** Site visit, Flight deck demonstration
11th week: **Lecture:** AREA NAVIGATION SYSTEMS, Flight Management System (FMS) and general terms, Navigation and flight management, Flight management computer, Navigation database, Performance database, Typical input/output data from the FMC, Determination of the FMS position of the aircraft **Practice:** Site visit, Flight deck demonstration	**12th week:** **Lecture:** AREA NAVIGATION SYSTEMS, Typical flight-deck equipment fitted on FMS aircraft, Control and Display Unit (CDU), EFIS instruments (attitude display, navigation display), Typical modes of the navigation display, Typical information on the navigation display **Practice:** Site visit, Flight deck demonstration
13th week: **Lecture:** GLOBAL NAVIGATION SATELLITE SYSTEMS, GPS, GLONASS, GALILEO, Principles, Operation NAVSTAR GPS, GLONASS, Errors and factors affecting accuracy **Practice:** System presentation	**14th week:** **Lecture:** GLOBAL NAVIGATION SATELLITE SYSTEMS, Ground, satellite and airborne-based augmentation, systems, Ground-Based Augmentation Systems (GBAS), Satellite-Based Augmentation Systems (SBAS), European Geostationary Navigation Overlay Service (EGNOS), Airborne-Based Augmentation Systems (ABAS) **Practice:** System presentation
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at lectures is recommended, but not compulsory.

Participation at practice classes is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

Operational Procedures (ATPL)

Code: MK3OPPRR02HX17-EN

ECTS Credit Points: 2

Evaluation: official exam

Year, Semester: 2nd year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: Yes/No

Number of teaching hours/week (lecture + practice): 1+2

Topics:

The course teaches the basic knowledge of Operational Procedures to demonstrate a level that grants a succesfull authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

The course covers the following main areas and give thorough information on:

Operator certification and supervision, operational procedure general requirements, special operational procedures and hazards (general aspects), all weather operations requirements, instrument and equipment, comms and navigation equipment, aeroplane maintenance, transoceanic and polar flight, fire and smoke, pressurisation failure, windshear and microburst, wake turbulence, emergency and precautionary landings, transport of dangerous goods by air, contaminated runways, north atlantic mnps airspace operation

By conducting the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the legal bacnground and basis of aviation, learn the structure and sources of the rules.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), OperationalProcedures, 2015, ISBN szám: 978 1 90620 275 0

Schedule

1st week Registration week	
2nd week: Lecture: GENERAL REQUIREMENTS, ICAO Annex 6, Definitions, General, Operational requirements, Operator certification and supervision Practice: Certification and supervision procedures	3rd week: Lecture: GENERAL REQUIREMENTS, Operational procedures (except long-range flight preparation), All-weather operations, Instruments and equipment, Communication and navigation equipment, Flight crew, Cabin crew/crew members other than flight crew Practice: Low-visibility operations, VFR operating minima, RVR
4th week: Lecture: GENERAL REQUIREMENTS, Manuals, logs and records, Flight and duty-time limitations and rest requirements, Transport of dangerous goods by air Practice: Flight and duty-time calculation, rostering examples	5th week: Lecture: GENERAL REQUIREMENTS, Long-range flights, Flight management, Transoceanic and polar flight, MNPS airspace, ETOPS Practice: Selection of cruising altitude, alternate aerodrome, Polar navigation
6th week: Lecture: SPECIAL OPERATIONAL PROCEDURES AND HAZARDS (GENERAL ASPECTS), Operations Manual, Operating procedures, Aeroplane/helicopter operating matters — type-related Practice: Operation manual presentation	7th week: Lecture: SPECIAL OPERATIONAL PROCEDURES AND HAZARDS, Icing conditions, On ground de-icing/anti-icing procedures, types of deicing/ anti-icing fluids, Procedure to apply in case of performance deterioration, on ground/in flight Practice: Usage of de-icing/anti-icing fluids holdover time table, pre-take-off check
8th week: 1st drawing week	
9th week: Lecture: SPECIAL OPERATIONAL PROCEDURES AND HAZARDS, Bird-strike risk and avoidance, Noise abatement, ,	10th week: Lecture: SPECIAL OPERATIONAL PROCEDURES AND HAZARDS, Fire and smoke, Carburettor fire, Engine fire, Fire in

Influence of the flight procedure (departure, cruise, approach), Influence by the pilot (power setting, low drag) **Practice:** Noise-abatement procedures	the cabin, cockpit, cargo compartment, Smoke in the cockpit and cabin, Actions in case of overheated brakes, Decompression of pressurised cabin, Slow decompression, Rapid and explosive decompression **Practice:** Aircraft Rescue Fire Fighting (ARFF) Training Facility and training demonstration
11th week:	**12th week:**
Lecture: SPECIAL OPERATIONAL PROCEDURES AND HAZARDS, Wind shear and microburst, Actions to avoid and actions to take during encounter, Wake turbulence, Cause, List of relevant parameters, Actions to be taken when crossing traffic, during take-off and landing **Practice:** Wind shear, microburst, wake turbulance case studies	**Lecture:** SPECIAL OPERATIONAL PROCEDURES AND HAZARDS, Security (unlawful events), ICAO Annex 17, Use of Secondary Surveillance Radar (SSR), Security, Emergency and precautionary landings, Definition, Cause, Passenger information, Action after landing, Evacuation **Practice:** Unlawful events case studies
13th week:	**14th week:**
Lecture: SPECIAL OPERATIONAL PROCEDURES AND HAZARDS, Fuel jettisoning, Safety aspects, Requirements, Transport of dangerous goods, ICAO Annex 18, Technical Instructions (ICAO Doc 9284), Transport of dangerous goods by air **Practice:** Dangerous goods loading examples	**Lecture:** SPECIAL OPERATIONAL PROCEDURES AND HAZARDS, Contaminated runways, Kinds of contamination, Estimated surface friction, friction coefficient, Hydroplaning principles and effects, Procedures, Snowtam **Practice:** Friction tester in operation, snowtam examples
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.

Communication VFR, IFR (ATPL)

Code: MK3COMMR02HX17-EN

ECTS Credit Points: 2

Evaluation: official exam

Year, Semester: 3rd year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: No

Number of teaching hours/week (lecture + practice): 1+2

Topics:

The course teaches the basic knowledge of Communication VFR/IFR to demonstrate a level that grants a successful authority exam according to FCL.515 ATPL — Training course and theoretical knowledge examinations.

The course covers the following main areas and give thorough information on:

General operating procedures, relevant weather information terms (VFR), action required to be taken in case of communication failure, distress and urgency procedures, relevant weather, information terms (IFR), general principles of VHF propagation and allocation of frequencies, morse code

By conducting the course the student will have the knowledge recommended by the EU legislation (AMC1 FCL.310; FCL.515 (b); FCL.615 (b) and will understand the legal background and basis of aviation, learn the structure and sources of the rules.

Literature:

Compulsory:

- CAE OXFORD AVIATION ACADEMY (UK), Communications, 2015, ISBN: 978 1 90620 277 4

Schedule

1st week Registration week	
2nd week: Lecture: DEFINITIONS, Meanings and significance of associated terms,	3rd week:

Practice: Air Traffic Control abbreviation examples	**Lecture:** DEFINITIONS, Q-code groups commonly used in RTF air– ground communications **Practice:** Categories of messages
4th week:	**5th week:**
Lecture: GENERAL OPERATING PROCEDURES, Transmissions **Practice:** Transmission of letters, Transmission of numbers (including level information), Transmission of time, Transmission technique	**Lecture:** GENERAL OPERATING PROCEDURES, Standard words and phrases (relevant RTF phraseology included) **Practice:** Standard words and phrases examples
6th week:	**7th week:**
Lecture: GENERAL OPERATING PROCEDURES, Radio-telephony call signs for aeronautical stations including use of abbreviated call signs, **Practice:** Radio-telephony call signs for aircraft including use of abbreviated call signs	**Lecture:** GENERAL OPERATING PROCEDURES, Transfer of communication, **Practice:** Test procedures including readability scale; establishment of RTF communication, Read-back and acknowledgement requirements
8th week: 1st drawing week	
9th week:	**10th week:**
Lecture: GENERAL OPERATING PROCEDURES, Radar procedural phraseology, **Practice:** Level changes and reports	**Lecture:** ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE, action to be taken in case of communication failure on an IFR flight when flying in VMC **Practice:** communication failure action examples
11th week:	**12th week:**
Lecture: DISTRESS AND URGENCY PROCEDURES, PAN MEDICAL, Distress (definition, frequencies, watch of distress frequencies), Urgency (definition, frequencies) **Practice:** distress signal, distress message, urgency signal, urgency message	**Lecture:** RELEVANT WEATHER INFORMATION TERM, Aerodrome weather, **Practice:** Weather broadcast
13th week:	**14th week:**
Lecture: GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF	**Lecture:** MORSE CODE, radio-navigation aids (VOR, DME, NDB, ILS) from their Morse-code identifiers,

FREQUENCIES, radio-frequency spectrum with particular reference to VHF, **Practice:** propagation characteristics of radio transmissions in the VHF band, the factors which reduce the effective range and quality of radio transmissions	**Practice:** SELCAL, TCAS, ACARS phraseology and procedures
15th week: 2nd drawing week	

Requirements

A, for a signature:

Attendance at **lectures** is recommended, but not compulsory.

Participation at **practice classes** is compulsory. A student must attend the practice classes and may not miss more than three times during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student can't make up any practice with another group. Attendance at practice classes will be recorded by the practice leader. Being late is equivalent with an absence. In case of further absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date, to be discussed with the tutor.

B, for grade:

The course ends with an official examination as set out in the regulations of 1178/2011/EU, Part-FCL.