

University of Debrecen  
Faculty of Engineering

## **Professional Pilot BSc Program**

2023

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## DEAN'S WELCOME

Welcome to UD's Faculty of Engineering!

The Faculty of Engineering of the University of Debrecen has become an outstanding centre of education and research in the Eastern Hungarian region. Following the footsteps of our predecessors, the academic and administrative staff of the Faculty work hand in hand to make our training programmes and researches meet both national and international standards.

The Faculty of Engineering is one of Hungary's most significant institutions of higher-education, and its 3000 students make it a dominant faculty of the University of Debrecen which - having the most international students, offering the most academic programmes among Hungarian universities and having been classified as a research university, the highest of qualifications - is officially listed among the best universities in the country.

We welcome the most outstanding and inquisitive students of the region with an enthusiastic and professional team of academics and researchers, and a set of laboratories unique in the country. We consciously aspire to develop the quality of education and research further, based on a close cooperation between the Faculty and the industry. Our students enter many prestigious competitions and they are becoming increasingly successful and acclaimed, while our instructors are working on a growing number of national and international projects of basic and applied research.

The Faculty bridges the gap between theory and practice and provides a high-quality theoretical background merged into practice-oriented training based on industrial relations. We do our best to maintain the high prestige of the engineering diplomas awarded by the University of Debrecen and to make sure that the knowledge and achievements of students who graduate from our Faculty continue to be recognised in the labour market.

All things considered, you are kindly advised to read this bulletin which hopefully reflects our endeavours appropriately and provides all the information you need to know about your chosen training programme. We are looking forward to supporting the personal and professional growth of our future engineers.

With the best of wishes for the years to come,

Géza Husi

Dean

## HISTORY OF THE UNIVERSITY

The history of Debrecen's higher education dates back to the 16<sup>th</sup> century. The Calvinist Reformed College, established in 1538, played a central role in education, teaching in the native language and spreading Hungarian culture in the region as well as in the whole country. The College was a sound base for the Hungarian Royal University, founded in 1912. Apart from the three academic faculties (arts, law, theology) a new faculty, the Faculty of Medicine was established, and the University soon became one of the regional citadels of Hungarian higher education. Today, University of Debrecen is classified as "University of National Excellence" and offers the highest number of academic programs in the country, therefore it is considered to be one of the best universities in Hungary. Its reputation is the result of its quality training, research activities and the numerous training programs in different fields of science and engineering in English. With 14 faculties and a student body of almost 30.000, out of which about 3700 are international students, the University of Debrecen is one of the largest higher education institutions in Hungary.

The history of the Faculty of Engineering dates back to 1965, when the Technical College was established. In 1972 it was renamed Ybl Miklós Polytechnic and in 1995 it became part of Kossuth Lajos University. In 2000 the Faculty of Engineering became part of the integrated University of Debrecen.

In 2005 the Bologna System was introduced which supports the competitiveness of qualifications received at the University of Debrecen against universities all over Europe.

The Faculty of Engineering is practice-oriented and develops skills required for the current needs of the national and international labour market. The teaching staff is involved in numerous domestic and international research and design projects. The recently-opened new building wing with its ultra-modern design hosts several lecture halls, seminar rooms and laboratories equipped with the latest technology. Our students are provided with practical knowledge, training and field practice from numerous prestigious domestic and multi-national industry partners. The internship periods are excellent opportunities for students to experience how theory is put into practice at the most renowned industry representatives and become more successful in the labour market of this highly competitive sector. Students learn how to work in the working environment of multi-national companies and adapt to challenges easily. After graduation they will be able to work at a strategic decision-making level, giving priority to efficiency and engineering ethics.

The Faculty of Engineering offers a great variety of BSc, MSc courses and post-graduate training courses tailored to the needs of the rapidly changing world of engineering and focusing on European and international trends. In 2011 the Faculty of Engineering launched engineering trainings in English. In order to optimize the quality of training, the Faculty continuously strives to expand the number of industrial and educational partners at home and abroad.

The Faculty of Engineering has been a pioneer in the introduction of Quality Management System at faculty level to measure and evaluate the efficiency of its education and

teaching staff in order to improve the quality of education and training from the feedback received.

The Faculty of Engineering has a vivid student life. There is a film club waiting for movie buffs and the door of the Faculty library is always open. The library is not only the host to the latest technical books, exhibitions and tea afternoons with invited speakers, but students can also purchase theatre and concert tickets from the librarians. The Borsos József Dormitory is also a hub of activities for students.

The increasing number of international students brings cultural and ethnic diversity to the faculty.

Our aim is to aid students to become efficient members of the labour market and enrich the world of engineering in Hungary and abroad with their knowledge and expertise.

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The Coordinating Centre for International Education supports the international degree programmes of the University of Debrecen in giving new students information on admission and entrance exam. It has tasks in promoting and is in charge of tasks like enrolment, study contracts, modifying student status or degree programme, activating student status, modifying students' personal data, requesting and updating student cards, providing certificates for the Immigration Office (for residence permit), issuing student status letters and certificates on credit recognition, concluding health insurance contract and providing Health Insurance Card, helping students with visa process application.

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The International Office has been functioning since 2014 in order to ensure the smooth running of the international degree courses. The office is responsible for student administration (full-time students, full-time transfer students, visiting/Erasmus students), providing certificates for students, considering and accepting requests, solving problems related to course registration, giving information about internship, final exam, thesis, etc.

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## DEPARTMENT OF AVIATION ENGINEERING

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## ACADEMIC CALENDAR

General structure of the academic year:

Study period	1 <sup>st</sup> week	Registration*	1 week
	2 <sup>nd</sup> – 7 <sup>th</sup> week	Teaching Block 1	6 weeks
	8 <sup>th</sup> week	1 <sup>st</sup> Drawing Week	1 week
	9 <sup>th</sup> – 14 <sup>th</sup> week	Teaching Block 2	6 weeks
	15 <sup>th</sup> week	2 <sup>nd</sup> Drawing Week	1 week
Exam period	directly after the study period	Exams	7 weeks

\*Usually, registration is scheduled for the first week of September in the fall semester, and for the first week of February in the spring semester.

### ACADEMIC CALENDAR OF THE FACULTY OF ENGINEERING 2023/2024

<b>Opening ceremony of the academic year</b>	3 September 2023 (Sunday)
Registration week	28 August – 3 September 2023
Revision week (exams in Exam courses may be scheduled during this week)	28 August – 1 September 2023
<b>1<sup>st</sup> semester study period in MSc and BSc programs</b>	4 September - 8 December 2023 (14 weeks) In case of finalist courses: 4 September - 3 November 2023 (9 weeks)
Reporting period I (Drawing week I)	16 - 20 October 2023 (4 working days without scheduled lessons, consultation schedule announced previously)
<b>Conferences, Career Days</b>	16-20 October 2023
Career Days in Mechanical Engineering (Exhibition and ISCAMÉ – International Scientific Conference on Advance in Mechanical Engineering) – organised by the Department of Mechanical Engineering	9 – 10 November 2023

Faculty Conference of Scientific Students' Association	24 November 2023
Reporting period II (Drawing week II)	4-8 December 2023 (5 working days without scheduled lessons, consultation schedule announced previously)
<b>1<sup>st</sup> semester examination period</b>	11 – 22 December 2023 (2 weeks) 8 January – 9 February 2024 (5 weeks) In case of finalist courses: 6 November - 8 December 2023 (5 weeks)
Thesis (BSc, MSc) submission deadline	As defined by the departments; max. 14 days of the beginning of the final examination period.
Final examination period	As defined by the departments; at least one occasion between 11 December 2023 and 26 January 2024.
Registration week	5 - 11 February 2024
<b>2<sup>nd</sup> semester study period in MSc and BSc programs</b>	12 February - 17 May 2024 (14 weeks) In case of finalist courses: 12 February - 12 April 2024 (9 weeks)
Reporting period I (Drawing week I)	25 - 28 March 2024 (5 working days without scheduled lessons, consultation schedule announced previously)
<b>Conferences, Career Days</b>	25-28 March 2024
<b>Career Days – “Industry Days in Debrecen 2024”</b> (working days without teaching for Mechanical Eng. BSc, Mechanical Eng. MSc, Environmental Eng. MSc, Mechatronics Eng. BSc, Mechatronics Eng. MSc, Civil Eng. BSc students)	27 - 28 March 2024
<i>Career Days and Exhibition in Building Services Engineering (organised by the</i>	9 - 10 May 2024

<i>Department of Building Services and Building Engineering)</i>	
<i>'Problem-based Learning in Engineering Education' Conference organised by the Department of Basic Technical Studies</i>	15 May 2024
Reporting period II (Drawing week II)	13 - 17 May 2024 (5 working days without scheduled lessons, consultation schedule announced previously).
<b>2<sup>nd</sup> semester examination period</b>	21 May – 5 July 2024 (7 weeks) In case of finalist courses: 15 April - 17 May 2024 (5 weeks)
Thesis (BSc, MSc) submission deadline	As defined by the departments; max. 14 days of the beginning of the final examination period.
Final examination period	As defined by the departments; at least one occasion between 21 May and 21 June 2024. The departments shall announce the date of the final examination until 20 February 2024.



# THE PROFESSIONAL PILOT UNDERGRADUATE PROGRAM

## INFORMATION ABOUT THE PROGRAM

Name of undergraduate program:	Professional Pilot Undergraduate Program
Specialization available:	-
Field, branch:	Engineering
Level:	BSc
Qualification:	Professional Pilot
Mode of attendance:	Full-time
Faculty:	Faculty of Engineering
Program coordinator:	Géza Husi PhD habil Full Professor
Program length:	7 semesters
Credits total:	210 credits

The aim of the program is to train professional pilots who are familiar with air transportation, able to fulfil the job of a professional pilot at firms and organizations, and to operate aircrafts. Also, they are able to carry out tasks related to air operation, ground handling, quality assurance, organizing and solving the transportation of cargo. They have completed the requirements of the ATP(A) (Airline Transport Pilot, Aircraft) integrated program. The degree offers the opportunity to advance to master's level study.

### *Professional competences to be acquired*

#### *a) knowledge*

He/She knows

- and applies English aviation terminology defined for professional pilot training according to EU Act 1178/2011 (03/11/2011).
- the conceptual system, the most essential relations and theories relating to his/her professional field.
- the main problem-solving and learning methods of the main theories in the field of aviation.
- the risk of fire and accidents and the scope of their prevention and avoidance.
- the international and domestic organizations of aviation, the regulations (ICAO Annex, the regulations of the European Union, EASA standards).
- the factors influencing aviation safety, the basics of Safety Management System (SMS).

- the basics of informatics (word processing, spread sheet and database management).
- and applies the theoretical basis of navigation and performance calculation.
- the basic concepts and phenomena of meteorology, their effect on flight and the atmospheric processes endangering flight.
- flight rules and procedures, the basics of developing procedures.
- and is able to apply the procedures of visual and instrumental navigation.
- and is able to apply the rules of radio communication.

*b) skills*

He/She is able to

- fly an aircraft in civil aviation by using his/her personal competences (responsibility, exactitude, stamina, stress tolerance, visual-spatial ability, movement coordination, manual skills, psychomotor functions, communication skills, divided attention, decisiveness).
- fly an aircraft in civil aviation by using his/her social competences (interpersonal skills, management skills, conflict resolution skills, teamwork, and cooperation).
- fly an aircraft in civil aviation by using his/her competences in methods [analytic thinking, self-control (self-checking skills), problem-solving, troubleshooting, situation awareness, thinking in systems, seeing the essence (understanding), decisiveness, prioritising].
- pass the theoretical and practical exams of ATP(A) integrated training.
- identify routine problems related to his/her profession, explore and describe the theoretical and practical background to solve them (with the practical application of standard procedures).
- understand literature and documentations written in English.
- carry out engineering tasks related to air operation and control.
- complete first mate tasks after type training on multi-crew aeroplanes.
- manage flights as an instrument-rated commercial pilot (with Commercial Pilot Licence/Instrument Rating, CPL/IR) in accordance with aviation regulations and rules in air.
- plan a flight and make the required navigation and performance calculation.
- create and submit a flight plan.
- operate airframes, engines, instruments and their systems in accordance with the instructions of Aircraft Flight Manual, recognize and handle hazards.
- operate the flight deck radio equipment and the radio-navigation system.
- navigate visually according to his/her individual limits under Visual Meteorological Conditions (VMC) on the basis of his/her geographical knowledge, map reading skills, visual and terrain objects identification skills and his/her proficiency.

- navigate with on-board instruments according to his/her individual limits under Instrument Meteorological Conditions (VMC) on the basis of his/her radio-navigation knowledge and proficiency.
- apply the rules of radiotelephony in English.
- analyse, assess meteorological situations and take all the necessary measures.
- interpret meteorological messages, charts and reports, consider them by flight planning and during flight.
- obey aviation safety rules.
- hold a management position in a department (e.g. flight operations, ground operations, flight safety, or compliance manager) after further training and considerable amount of practice.
- endure the monotony of work to complete practical tasks.

*c) attitude*

He/she

- aims for continuous self-development in the field of aviation in accordance with his/her professional endeavours.
- aims to solve problems and make leadership decisions relying on the opinions of his/her inferiors and in cooperation with them.
- shares his/her experience with his/her co-workers to promote his/her development.

*d) his/her autonomy and responsibility*

He/she

- supervises the work of personnel he/she is in charge of according to the instructions of his/her superior, and monitors the operation of machines and facilities.
- evaluates the effectiveness, efficiency and security of his/her inferiors' work.
- monitors the development of his/her co-workers and promotes their professional development.
- monitors the changes of law, technique, technology and administration in his/her professional field.

## Program Specifications

Entry requirements for the undergraduate training programme:

- Language exam in English level B2, type: complex or GCSE exam or a certificate of the same level and type.

- Class 1 medical certificate pursuant to Commission Regulation (EU) No. 1178/2011 (03/11/2011) Medical (MED) requirements.

A professional pilot bachelor's degree itself does not entitle anyone to provide activities of a professional pilot. The requirement of issuing a certificate of basic qualification is to obtain a pilot licence. A professional pilot and pilot licences can be acquired after passing accredited theoretical and practical exams at Aviation Administration of National Transport Authority. The requirement of issuing a certificate of basic qualification is to obtain a pilot licence for professional pilot activities.

### Credit System

Majors in the Hungarian Education System have generally been instituted and ruled by the Act of Parliament under the Higher Education Act. The higher education system meets the qualifications of the Bologna Process that defines the qualifications in terms of learning outcomes: statements of what students know and can do on completing their degrees. In describing the cycles, the framework uses the European Credit Transfer and Accumulation System (ECTS).

ECTS was developed as an instrument of improving academic recognition throughout the European Universities by means of effective and general mechanisms. ECTS serves as a model of academic recognition, as it provides greater transparency of study programs and student achievement. ECTS in no way regulates the content, structure and/or equivalence of study programs.

Regarding each major, the Higher Education Act prescribes which professional fields define a certain training program. It contains the proportion of the subject groups: natural sciences, economics and humanities, profession-related subjects and differentiated field-specific subjects.

The following professional fields define the Professional Pilot BSc training programme:

*Natural Sciences:* 40-46 credits;

*Economics and Humanities:* 14-26 credits;

*Field-specific professional skills for professional pilots:* 70-95 credits.

*Minimum of credit points assigned to optional subjects:* 10

*Credit points assigned to thesis:* 15

Credits total: 210

## Guideline (Lisf of Subjects/Semesters)

The total number of credit points (210) of the training program can be obtained by completing the subjects of the curriculum. There is a certain degree of freedom in the order students can complete the subjects. However, it is recommended to follow the suggested order because some subjects can only be taken after the completion of the prerequisite subject(s), and/or can be the prerequisites for other subjects.

The list of subjects you have to complete in the semesters according to the model curriculum of Professional Pilot BSc programme:

1 <sup>st</sup> semester	
Faculty of Engineering	ATP(A)
Aviation Terminology I	Basics of Aviation I
Engineering Physics	Theoretical Knowledge of Airline
Informatics for Engineers I	Transport Pilot Licence I (ATPL)
Mathematics I	
Statics and Strength of Materials	
Thermodynamics and Fluid Mechanics I	
2 <sup>nd</sup> semester	
Faculty of Engineering	ATP(A)
Aircraft Technology	Basics of Aviation II
Aviation Terminology II	Communication VFR (ATPL)
Dynamics and Vibration	Internship I
Mathematics II	Meteorology I (ATPL)
Mathematics Comprehensive Exam	Theoretical Knowledge of Airline
Thermodynamics and Fluid Mechanics II	Transport Pilot Licence II (ATPL)
3 <sup>rd</sup> semester	
Faculty of Engineering	ATP(A)
Descriptive Geometry	Flight Training I
Electrotechnics and Electronics	General Navigation (ATPL)
Mechanical Machines and Machine Elements	Meteorology II (ATPL)

Mechatronic Devices (Sensors, Actuators, Motors)      Theoretical Knowledge of Airline Transport Pilot Licence III (ATPL)

Optional Subject I

4 <sup>th</sup> semester	
Faculty of Engineering	ATP(A)
Economics for Engineers Manufacturing Technologies	Aircraft General Knowledge I - Airframe, Systems, Power Plants (ATPL)
Materials Engineering Technique of Measurement	Aircraft General Knowledge – Instrumentation (ATPL)
Optional Subject II	Communication IFR (ATPL) Flight Training II Internship II Radionavigation (ATPL)

5 <sup>th</sup> semester	
Faculty of Engineering	ATP(A)
Environmental Protection and Dangerous Goods	Air Law (ATPL)
Manufacturing Technologies	Aircraft General Knowledge II - Airframe, Systems, Power Plants (ATPL)
Microeconomics and Economical Processes of Enterprises	Flight Planning and Monitoring (ATPL)
Quality and Technical Management	Flight Training III
Optional Subject III	

6 <sup>th</sup> semester	
Faculty of Engineering	ATP(A)
Environment, Health and Safety, Ergonomics (Basics of EHS)	Flight Training IV
Thesis I	Human Performance (ATPL)
Optional Subject IV	Internship III

Mass and Balance (ATPL)

Operational Procedures (ATPL)

Performance (ATPL)

7 <sup>th</sup> semester	
Faculty of Engineering	ATP(A)
Thesis II	Flight Training V
Optional Subject V	Type Rating or APS MCC and JOC

About the prerequisites of each subject please read the chapter “Course Descriptions for Professional Pilot BSc”!

## Work and Fire Safety Course

According to the Rules and Regulations of the University of Debrecen, students must complete the online course for work and fire safety in the first semester of their studies. Registration for the course and its completion are necessary for graduation. Registration in the Neptun system by the subject: MUNKAVEDELEM

Students have to watch/read an online material to get the signature on Neptun for the completion of the course. The link of the online course is available on the website of the Faculty.

Special emergency, safety and compliance requirements apply to the flight training at the Department of Aviation Engineering. These rules are set and communicated by the Department.

## Internship

Professional Pilot BSc students have to do internship in three parts (8, 8 and 8 weeks) as described in the model curriculum. Internship courses are offered in the second, fourth and sixth semester.

Internships involve daily flights during the relevant 8-week period in summer. Number of credit points assigned to internship: 10. Internship can be undertaken at an external internship place (ATO, Approved Training Organization) with which the higher education institution has an agreement and which has been approved and monitored by the National Transport Authority.

*Special prerequisites of the internship:*

- ICAO level 4 language exam or above level,
- EASA Class 1 medical certificate pursuant to Commission Regulation (EU) No. 1178/2011 (03/11/2011) Medical (MED) Requirements.

## Modules

There are two modules available for the students during the 7<sup>th</sup> semester. The Approved Training Organization (ATO) assign the modul for the student based on their individual performance and final result until the beginning of 7<sup>th</sup> semester in accordance with the grading system published in Regulation 1178/2011/EU (Part-FCL) considering the complexity of the course. To apply for the module, a written recommendation from the Head of Training of the ATO and an approval from the Dean is required. The moduls are as follows:



1. Modul based on Type Rating Course
  - Prerequisites:
  - Successful completion of Flight Training IV and Internship III subjects with final result grade 4 or better until the beginning of 7th semester,
  - Successfully passed 13 ATPL theoretical knowledge exams until the beginning of 7th semester,
  - Successfully passed CPL/IR skill test until the beginning of 7th semester.
  - Modul subject: Type Rating Course
  
2. Modul based on Airline Pilot Standard Multi Crew Cooperation and Jet Orientation Course (APS MCC and JOC)
  - Prerequisites:
  - Successful completion of Flight Training IV
  - Successfully passed 13 ATPL theoretical knowledge exams.
  - Modul subject: APS MCC and JOC

### Training Termination

The training shall not be continued if the student is unable to meet the requirements for the professional pilot BSc program and the training elements specified in the given training manual developed by the Regulation 1178/2011/EU (03.11.2011). The student will receive a detailed explanation of the reason for the training suspension.

### Physical Education

According to the Rules and Regulations of the University of Debrecen, students must complete Physical Education course at least in two semester during his/her BSc studies. Our University offers a wide range of facilities to complete them. Further information is available from the Sport Centre of the University, its website: <http://sportsci.unideb.hu>.

### Optional Courses

According to the Rules and Regulations of the University of Debrecen, students must complete elective courses during their BSc studies. These elective courses are opened by the Departments at the Faculty of Engineering at the beginning of the actual semester. Students can also select optional courses offered by other faculties of University of Debrecen to complete.

Optional subjects can be completed in any semester and with any number of subjects but in the Professional Pilot BSc programme you have to gain at least 10 credits by completing optional subjects.

The list of the actual semester's optional subjects can be found under "Current Students">"Useful Information about your Study">"Optional subjects".

### Pre-degree Certification

A pre-degree certificate is issued by the Faculty after completion of the bachelor (BSc) program. The pre-degree certificate can be issued if the student has successfully completed the study and exam requirements as set out in the curriculum, the requirements related to Physical Education, internship (mandatory) – with the exception of preparing thesis – and gained the necessary credit points (210). The pre-degree certificate verifies (without any mention of assessment or grades) that the student has fulfilled all the necessary study and exam requirements defined in the curriculum and the requirements for Physical Education. Students who obtained the pre-degree certificate can submit the thesis and take the final exam.

### Thesis

Thesis is the creative elaboration of a professional task (engineering, design, development, research or research development) in written form as defined in the requirements of the training program. By solving the task, the student relies on his/her studies utilizing national and international literature under the guidance of an internal and external supervisor (if needed). By preparing and defending thesis students - who complete the Professional Pilot undergraduate program - prove that they are capable of the practical applications of the acquired skills, summarizing the work done and its results in a professional way, creatively solving the tasks related to the topic and doing individual professional work.

Students in the BSc program must write a thesis as a prerequisite of the final exam. Requirements of the training program contain the content requirements for thesis, general aspects of the evaluation and the number of credit points assigned to thesis (15).

Thesis topics are announced by the departments no later than the end of the fourth week of the study period of the last but one semester. Students may also offer a topic for the thesis, which the competent head of department may accept or reject. The conditions on the acceptance of a SSS (Student Scientific Society) paper as a degree thesis are defined

by the Faculty. SSS papers are supposed to meet the requirements of a thesis both in form and content. Furthermore, it is necessary that the committee of the Pre-SSS make suggestions on the SSS papers to be accepted as theses.

Formal requirements of thesis shall be designated by the Department of Air- and Road Vehicles and must be announced in writing together with other thesis-related assignments.

The preparation of a thesis shall be overseen by an internal supervisor approved by the department, and may be assisted by an external supervisor (also approved by the department).

The faculty academic calendar (issued by the Vice-Rector for Education) sets the thesis submission deadline, for want of this the deadline is the 14. day 12 noon before the first day of the final exam.

The thesis submission deadline is defined in the academic calendar of the Faculty (issued by the Vice-Rector for Education) or, failing that, it is 12 a.m. on the 14<sup>th</sup> day before the first day of the final exam. The thesis can be submitted only if both the internal and the external supervisors approve. It is evaluated by an independent external reviewer, and the Head of the Department of Air- and Road Vehicles makes a suggestion to the final examination board on its classification based on a five-grade scale.

If the reviewer evaluates the thesis firmly as fail, the student may not take the final exam and must create a new thesis. Students must be informed about it. Conditions on resubmitting the thesis are designated by the head of the relevant educational unit responsible for the major or specialization.

## Final exam

After receiving the pre-degree certificate, students conclude their studies by taking the final exam of Professional Pilot undergraduate (BSc) program. The final exam shall test and assess the knowledge, skills and abilities requisite to the award of the degree, whereby students shall also prove their ability to apply the acquired knowledge in practice. The conditions for taking the final exam and the parts of the final exam itself shall be defined in the requirements for the training program.

The final exam shall be taken in the first exam period following the award of the pre-degree certificate or within 2 years after the termination of student status in any exam period according to the requirements of the training program. After the fifth year of the termination of student status, the candidate is not allowed to take the final exam. Only students who do not have outstanding charges are allowed to take the final exam.

In each academic year, there are two final exams: one in January, another one in June. The final exam shall be taken in front of a board on the previously announced exam dates. If the candidate fails to take the final exam until the termination of his/her student status, then he/she is allowed to take the exam any time after the termination of his/her student status on the dates according to the regulations which applied when the candidate was supposed to take the final exam for the first time.

*Diploma requirements:*

Language exam in English (level: B2, type: complex) or GCSE exam or a certificate of the same level and type and a good command of Professional English according to Commission Regulation (EU) No. 1178/2011 (03/11/2011) which lays down the conditions on professional pilot training.

The chief forms of testing and assessing knowledge are included in Article 18 of Rules and Regulations of the University of Debrecen, the order of examinations is specified in Article 19. The supplement, along with special provisions for the Faculty of Engineering, is included in the Rules and Regulations, as well. The course requirements of the training programme have previously been specified.

*Conditions on taking the final exam:*

- obtaining the credit points defined in the requirements and the curriculum of the program,
- fulfilling requirements to which no credit points have previously been assigned,
- thesis reviewed and accepted by the referees

holding licences, passing the exams of the Hungarian Aviation Authority.

*Final exam board:*

The final exam board consists of the chair, the vice-chair, the members and the examiners. The chairperson final examination board shall be delegated and commissioned with the consent of the Faculty Council by the dean of the faculty. He/she is selected from the acknowledged external experts of the professional field. Traditionally, a chairperson and, in case of his/her absence or indisposition, a vice-chair shall be commissioned. The exam board consists of – besides the chair or the vice-chair – at least one member (university professor, college professor or associate professor) and at least two examiners (associate professor /college level/, senior lecturer, junior lecturer, dept. teacher). In case of equal division of the votes, the chairperson shall be given the casting vote.

*Final exam process*

Final exam consists of two parts:

- Thesis presentation and defence,

- The candidate is expected to select a topic randomly from the subjects of the final exam and will be examined after preparation.

The final exam shall start if the thesis has previously been accepted unanimously both by the reviewer and the department. The two parts of the final exam shall not be separated. Both parts of the final exam shall be assessed on a five-grade scale by the members of the final examination board. The board shall then consult behind closed doors and vote about the final grade for the final exam. The result of the final exam shall be announced by a member of the board. A grade is awarded for the thesis, its defence and the answers to the questions related to the thesis respectively. Minutes shall be taken during the final examination.

*Final exam topics:*

- Type rating course module:
  - ATPL(A) subjects' topics
  - Type rating course topics
- APS MCC and JOC module:
  - ATPL(A) subjects' topics
  - APS MCC course topics

*Final exam grade:*

The grade of the final exam is the average of the grades awarded for the oral part of the final exam and thesis. Therefore, it is calculated as follows:

$$x = \frac{b + c}{2}$$

where

$x$ = final exam grade

$b$ = average of the grades awarded for the oral part of the final exam, rounded down to two decimal places,

$c$ = grade awarded for thesis.

*Improving failed final exam:*

If any part of the final exam is evaluated as fail, according to the existing rules of the university, it can be retaken. If a thesis is evaluated unanimously as fail, the student may not take the final exam and shall write a new, modified thesis. The retake of the final exam may be attempted in the following examination period at the earliest.

## SPECIAL INFORMATION RELATED TO THE ATO COURSES

For the general rules for ATO course, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website (<https://aircraft.unideb.hu/en/training-guidance>) and the ATO online administrative interface.

## COURSE DESCRIPTIONS FOR PROFESSIONAL PILOT BSC

1st semester

### Mathematics I

Subject group: Basic Natural Sciences – Faculty of Engineering

Model curriculum number: 1

Code: MK3MAT1A08GX17\_EN, MK3MAT1A08EX17\_EN, MK3MAT1A08RX17\_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

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.

Part A - Linear algebra: real numbers, coordinate systems, sets, sequences of real numbers and their limit, series of real and complex numbers, series of real functions, vector geometry, vector algebra and applications, the set of the complex numbers, complex series, approximation of real functions, matrices, determinants, vector spaces, systems of linear equations, linear functions

Part B - Differential and integral calculus: real functions, elementary functions, limit and continuity of real functions, differentiation, L'Hospital's rule, Taylor polynomial, analysis of differentiable functions, primitive function (antiderivative), indefinite integral, the Riemann integral, the Newton-Leibniz theorem, numerical integration, improper integral, applications of the integral

#### Literature:

Required:

- Adrienn Varga, Mathematical Analysis for Engineers, Debrecen, Hungary: Dupress (2019), 118 p. ISBN: 9789633188156
- Lajos Hajdu; Adrienn, Varga, Engineering Mathematics: part I. Debrecen, Hungary: Dupress (2021), 154 p. ISBN: 9789633189030

Recommended:

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

Recommended textbook:

Sziki Gusztáv Áron, Nagy Kondor Rita, Kézi Csaba, Differential and integral calculus for Engineering and Economists Debrecen, Magyarország: Dupress (2019), 225 p. ISBN: 9789633187418

## Schedule

### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

##### Lecture:

Part A: Real numbers, coordinate systems

Part B: Real functions

##### Practice:

Part A: Sets

Part B: Real functions

#### 4<sup>th</sup> week:

##### Lecture:

Part A: Series of real numbers

Part B: Limits of real functions, continuity of real functions

##### Practice:

Part A: Vector geometry, vector algebra

Part B: Calculations of limits of real functions

#### 6<sup>th</sup> week:

##### Lecture:

Part A: Approximations of real functions

Lagrange interpolation. Linear regression.

Part B: Differentiation: L'Hospital's rule, Taylor polynomials.

#### 3<sup>rd</sup> week:

##### Lecture:

Part A: Sequences of real numbers and their limit

Part B: Elementary functions

##### Practice:

Part A: Vector geometry, vector algebra

Part B: Rational fractions, inverse functions

#### 5<sup>th</sup> week:

##### Lecture:

Part A: Series of real functions

Part B: Differentiation

##### Practice:

Part A: The set of the complex numbers

Part B: Differentiation

#### 7<sup>th</sup> week:

##### Lecture:

Part A: Series of real numbers

Part B: Mean value theorems. Investigation of differentiable functions.

##### Practice:

Part A: Summary, sample test



**Practice:**

Part A: Sequences of real numbers.

Part B: Differentiation: L'Hospital's rule.  
Taylor polynomials.

Part B: Summary, sample test

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Lecture:**

Part A: Matrices

Part B : Primitive function (antiderivative),  
indefinite integral

**Practice:**

Part A: Matrices

Part B: Determinations of primitive  
functions.

**10<sup>th</sup> week:**

**Lecture:**

Part A: Vector spaces

Part B: Riemann integral

**Practice:**

Part A: Vector spaces

Part B: Determinations of primitive  
functions

**11<sup>th</sup> week:**

**Lecture:**

Part A: Systems of linear equations

Part B: Improper integrals. Numerical  
integration.

**Practice:**

Part A: Solutions of systems of linear  
equations

Part B: Determination of Riemann integral

**12<sup>th</sup> week:**

**Lecture:**

Part A: Linear functions

Part B: Applications of the integration in  
geometry and physics

**Practice:**

Part A: Linear transformations of the plane  
and the space

Part B: Improper integrals. Numerical  
integration

**13<sup>th</sup> week:**

**Lecture:**

Part A: Linear functions

Part B – Plane curves

**Practice:**

Part A: Determinations of eigenvalues,  
eigenvectors.

**14<sup>th</sup> week:**

**Lecture:**

Part A: Mathematical software

Part B: Mathematical software

**Practice:**

Part A : Summary, sample test

Part B : Summary, sample test

## Requirements

### A, for a signature and mid-semester grade:

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. The final grade can be obtained in the following way:

- students write a mid-term test (Test I, A) from the linear algebra part of the material in the first drawing week; maximum 50 points can be achieved
- students write a mid-term test (Test I, B) from the differential and integral calculus part of the material in the first drawing week; maximum 50 points can be achieved
- students write an end-term test (Test II, A) from the linear algebra part of the material in the second drawing week; maximum 50 points can be achieved
- students write an end-term test (Test II, B) from the differential and integral calculus part of the material in the second drawing week; maximum 50 points can be achieved

Mark ranges after the four tests:

- 175-200 points: excellent (5)
- 150-174 points: good (4)
- 125-149 points: satisfactory (3)
- 100-124 points: sufficient (2)
- 0-99 points: insufficient (1)

Those who fail, or do not accept their marks, can write a Test in any of the first three weeks of the exam period. This Test is a combination of the previous four tests, maximum 50 points can be achieved, and the mark ranges are proportional to the above table. For exam dates see Neptun. If someone does not accept her/his mark, it is possible to get any mark (better, the same, or worse) than the original mark by writing this Test.

## Statics and Strength of Materials

Subject group: Basic Natural Sciences – Faculty of Engineering

Model curriculum number: 4

Code: MK3STSZG04XX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 1<sup>th</sup> year, 1<sup>th</sup> semester

Its prerequisite(s): -

Further courses are built on it: 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, excentric 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

### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

**Lecture:** Mathematical preliminaries (vector-, matrixalgebra). Introduction to engineering mechanics. Statics of a particle

**Practice:** Calculation the resultant of 2 and 3 dimensional force systems acting on particles.

#### 4<sup>th</sup> week:

**Lecture:** Statics of planar structures. Supports and reaction forces.

**Practice:** Practical examples for the determination of the reaction forces of statically determined structures.

#### 6<sup>th</sup> week:

**Lecture:** Determination of stress resultant diagrams of beams.

**Practice:** Practical examples for the determination of the normal force, shear force and bending moment diagrams of beams.

### 8<sup>th</sup> week: 1<sup>st</sup> drawing week

#### 9<sup>th</sup> week:

**Lecture:** Fundamentals of Strength of Materials. Displacement-, strain- and stress field. Constitutive equation (Hooke's law).

**Practice:** Practical examples for strain and stress calculations.

#### 11<sup>th</sup> week:

**Lecture:** Simple loadings II: torsion of prismatic beams with circular and ring cross sections. Mohr's circle. Shear.

**Practice:** Practical examples for torsion and shear.

#### 13<sup>th</sup> week:

#### 3<sup>rd</sup> week:

**Lecture:** Statics of rigid bodies. Moments. Equilibrium state of a rigid body. Planar force systems.

**Practice:** Calculation of moments. Examples for equilibrium state of rigid bodies and for planar force systems.

#### 5<sup>th</sup> week:

**Lecture:** Internal force systems of rigid bodies. Loading of beams.

**Practice:** Practical examples for the determination of the normal force, shear force and bending moment functions of beams.

#### 7<sup>th</sup> week:

**Lecture:** Statically determined beam structures.

**Practice:** Analysis of hinged-bar systems and truss systems. **1<sup>st</sup> test.**

#### 10<sup>th</sup> week:

**Lecture:** Simple loadings I: tension, compression and bending of prismatic beams. Fundamentals of sizing and control.

**Practice:** Practical examples for tension, compression and bending.

#### 12<sup>th</sup> week:

**Lecture:** Combined loadings I: tension and bending, inclined bending, excentral tension.

**Practice:** Practical examples for combined loadings.

#### 14<sup>th</sup> week:

**Lecture:** The finite element method.

**Lecture:** Combined loadings II: tension and torsion, bending and torsion. Sizing methods.

**Practice:** Practical examples for combined loadings.

**Practice:** Case studies for numerical calculation of engineering structures. **2<sup>nd</sup> test.**

**15<sup>th</sup> week: 2<sup>nd</sup> 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 classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students cannot 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 more than three 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 does not 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 1<sup>st</sup> test in the 7<sup>th</sup> week and the 2<sup>nd</sup> test in the 14<sup>th</sup> 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

Subject group: Basic Natural Sciences – Faculty of Engineering

Model curriculum number: 5

Code: MK3MFIZA04RX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 1<sup>st</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): -

Further courses are built on it: Yes

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

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> 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.

**Practice:** Solving problems for the reflection and refraction of light beams and for the imaging of lenses and compound lenses.

#### 4<sup>th</sup> 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.

#### 3<sup>rd</sup> 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 uniform and uniformly varying motions.

#### 5<sup>th</sup> week:

**Lecture:** Kinetics of particles I. Inertial frame of reference, Newton's Laws, force formulas. Application of Newton's Laws in static and dynamic problems.

**Practice:** Solving throwing and circular motion problems.

**6<sup>th</sup> week:**

**Lecture:** Kinetics of 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.

**8<sup>th</sup> week: 1<sup>st</sup> drawing week Test 1**

**9<sup>th</sup> 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.

**11<sup>th</sup> 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, Kirchhoff's circuit laws, solution of DC circuits

**Practice:** Solution of DC circuits

**13<sup>th</sup> 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:** Application of Newton's laws in kinetic problems.

**7<sup>th</sup> week:**

**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.

**10<sup>th</sup> week:**

**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.

**12<sup>th</sup> week:**

**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 state temperature distribution in a one dimensional wall of thermal conductivity

**Practice:** Solving thermal conduction problems

**14<sup>th</sup> 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

**Practice:** Calculating the steady state temperature distribution in a one-dimensional wall of thermal conductivity.

displacement law, Stefan-Boltzmann and Kirchhoff's law), gray body radiation

**Practice:** Solving thermal radiation problems.

## 15<sup>th</sup> week: 2<sup>nd</sup> 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 counts as 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 cannot 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:

Students 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

Subject group: Basic Natural Sciences – Faculty of Engineering

Model curriculum number: 7

Code: MK3THE1R06HX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 1<sup>st</sup> year, 1<sup>st</sup> semester



Its prerequisite(s): -

Further courses are built on it: Yes

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 polytropic 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

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> 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

#### 4<sup>th</sup> week:

#### 3<sup>rd</sup> week:

**Lecture:** The isotherm, isochor, isobar, adiabatic and polytropic process. The First Law of Thermodynamics: Conservation of Energy

**Practice:** Solving problems in the theme of the lecture

#### 5<sup>th</sup> week:

**Lecture:** Corollaries of the First Law. Generalized Representation of Thermodynamic Cycles.

**Practice:** Solving problems in the theme of the lecture

**6<sup>th</sup> week:**

**Lecture:** Reversibility and Irreversibility in Natural Processes. Technical work. Enthalpy. Exergy.

**Practice:** Solving problems in the theme of the lecture

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Lecture:** Steam. Humid air. T-s diagram.

**Practice:** Solving problems in the theme of the lecture

**11<sup>th</sup> 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.

**13<sup>th</sup> 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

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

**Lecture:** The Carnot Cycle. Entropy. The second law of Thermodynamics.

**Practice:** Solving problems in the theme of the lecture

**7<sup>th</sup> week:**

**Lecture:** Mixtures: Partial pressure, Dalton's laws. Gas mixtures. Gas mixtures. Real gases.

**Practice:** Solving problems in the theme of the lecture

**10<sup>th</sup> week:**

**Lecture:** Energy cycles. Carnot's Cycle, Joule's cycle.

**Practice:** Solving problems in the theme of the lecture

**12<sup>th</sup> week:**

**Lecture:** Fundamental equations. General differential equation of heat conduction. Steady state and transient conduction.

**Practice:** Solving problems in the theme of the lecture

**14<sup>th</sup> week:**

**Lecture:** Free convection, forced convection (the Reynolds, Grasshof, Prandtl, Nusselt numbers).

**Practice:** Solving problems in the theme of the lecture

**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 may 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 cannot 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 more than three absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date previously 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 does not 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 0.7 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);

## **Aviation Terminology I**

Subject group: Economics and Humanities – Faculty of Engineering

Model curriculum number: 14

Code: MK3AVT1R01HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 1<sup>st</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): -

Further courses are built on it: Yes

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

### **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 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: 978 0 19 457943 8

Philip Shawcross: Flightpath, Aviation English for Pilots and ATCos. Cambridge Professional English. CUP. 2011.ISBN: 978-0521178716

*Recommended:*

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

**Schedule**

<b>1<sup>st</sup> week Registration week</b>	
<b>2<sup>nd</sup> week:</b> <b>Practice:</b> Introduction to air communication : ICAO alphabet and numbers. Basics of radiocommunication, asking for repetition.	<b>3<sup>rd</sup> week:</b> <b>Practice:</b> Introduction of non-routine situations, imaginary situations. Pre-flight checks, asking for more time.
<b>4<sup>th</sup> week:</b> <b>Practice:</b> Delays and problems: giving a reason. Pre-flight: local conditions, requesting actions.	<b>5<sup>th</sup> week:</b> <b>Practice:</b> Ground movements: airport markings and airside vehicles. Taxiing and holding.
<b>6<sup>th</sup> week:</b> <b>Practice:</b> Weather problems. Departure, climbing and cruising: take-off, checking and asking for an alternative.	<b>7<sup>th</sup> week:</b> <b>Practice:</b> Encountering traffic, prepositions of positions. Warnings about hazards, giving reasons.
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	
<b>9<sup>th</sup> week:</b> <b>Practice:</b> En route events: explaining changes, operational situations, comparing things. Unusual events, stating a problem.	<b>10<sup>th</sup> week:</b> <b>Practice:</b> Medical situations. Contact and approach :descent, saying what you are going to do.

**11<sup>th</sup> week:**

**Practice:** Weather conditions, explaining changes in plans. Approach and landing problems, requests.

**13<sup>th</sup> week:**

**Practice:** Landing hazards. On the ground, incidents between landing and arrival at the stand.

**12<sup>th</sup> week:**

**Practice:** Landing: landing incidents. Circuit joining.

**14<sup>th</sup> week:**

**Practice:** Getting to the gate. Clear communication, the future of flight.

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week****Requirements****A, for a signature:**

Participation at **practice classes** is compulsory. Students must attend the practice classes and may not miss more than three classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students cannot make up any practices with other groups. Attendance at practice classes will be recorded by the practice leader. Being late counts as an absence. In case of more than three absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date previously 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**

Subject group: Specific Compulsory Subjects – Faculty of Engineering

Model curriculum number: 18

Code: MK3INFEA04RX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 1<sup>st</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): -

Further courses are built on it: No

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

**Topics:**

Lecture:

Number systems, number representations, and character codes (ASCII, UNICODE). Database models (hierarchical, network, ER, relational, object-oriented), normalization (1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, Boyce-Codd, 4<sup>th</sup>, 5<sup>th</sup> normal forms). Databases (hierarchical, network,

relational, object-oriented, OLTP, OLAP) The Structured Query Language. Data structures (set, array, list, record, tree, file). Searching algorithms (full, linear, binary). Sorting algorithms (selection, bubble, insertion, quick). Computer programming (basic concepts, pseudo-code, flowchart, development models, data types, variable declarations, control structures, loops ...). Data compression (lossless and lossy compression algorithms). Data security (symmetric and asymmetric cyphers)

Practice:

We are implementing a real-world project, from data acquisition through the process of data to graphical results.

LabVIEW – for data acquisition and data storing

Excel and VBA Macros – for data process and graphical display

### Literature:

*Recommended:*

- Microsoft Excel 2016 Bible: The Comprehensive Tutorial Resource
- Microsoft VBA 2016 Bible: The Comprehensive Tutorial Resource
- Jennings Richard: LabVIEW Graphical Programming, Fifth Edition

### Schedule

1 <sup>st</sup> week Registration week	
<p><b>2<sup>nd</sup> week:</b></p> <p><b>Lecture:</b> Number systems, number representations, character codes</p> <p><b>Practice:</b> Introduction to the course project</p> <ul style="list-style-type: none"> <li>• Measurement System for electric motors</li> <li>• LabVIEW simulated signal generating</li> </ul>	<p><b>3<sup>rd</sup> week: Excel 2.</b></p> <p><b>Lecture:</b> Database models</p> <p><b>Practice:</b> LabVIEW DAQmx</p> <ul style="list-style-type: none"> <li>• Signal processing</li> <li>• Storing data in a measurement file</li> </ul>
<p><b>4<sup>th</sup> week: Excel 3.</b></p> <p><b>Lecture:</b> Database model normalization, databases</p> <p><b>Practice:</b> Importing data into Excel</p> <ul style="list-style-type: none"> <li>• import from file (.txt, .csv, .lvm)</li> </ul>	<p><b>5<sup>th</sup> week: Excel 4.</b></p> <p><b>Lecture:</b> SQL</p> <p><b>Practice:</b> Excel data processing</p> <p>Analyzing data:</p> <ul style="list-style-type: none"> <li>• Ordering, summarizing, a range.</li> <li>• Filter a range.</li> <li>• Summarize data with subtotals.</li> </ul>
<p><b>6<sup>th</sup> week: Excel 5.</b></p> <p><b>Lecture:</b> Data structures (set, array, list, record)</p>	<p><b>7<sup>th</sup> week: Excel 6.</b></p> <p><b>Lecture:</b> Data structures (graph, tree, file)</p> <p><b>Practice:</b> Excel data representation</p>

**Practice:** Excel data processing

Formulas:

- Building Formulas.
- Move or copy a Formula.
- Reference Range or Sheet

Conditional and database functions:

- IF, SUMIF
- CHOOSE
- VLOOKUP, HLOOKUP, INDEX, MATCH

**8<sup>th</sup> week: 1<sup>st</sup> drawing week:** Midterm test

**9<sup>th</sup> week: VBA 1.**

**Lecture:** Searching algorithms

**Practice:** Automation of data processing with VBA

Visual Basic for Applications (VBA) basics

- Variables.
- Data-Types
- Constants

**11<sup>th</sup> week: VBA 3.**

**Lecture:** Computer programming (basic concepts, pseudo-code, flowchart, development models)

**Practice:** Automation of data processing with VBA

- Arrays

**13<sup>th</sup> week: VBA 5.**

**Lecture:** Data compression (examples of lossless and lossy compression algorithms)

**Practice:** Automation of data processing with VBA

- Subroutine
- Function

Graphical representation in Excel:

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

Practising for the Midterm test

**10<sup>th</sup> week: VBA 2.**

**Lecture:** Sorting algorithms

**Practice:** Automation of data processing with VBA

- Arithmetic Operators
- Logical Operators.
- Comparison Operators
- String Operators

**12<sup>th</sup> week: VBA 4.**

**Lecture:** Computer programming (datatypes, variable declarations, control structures, loops ...)

**Practice:** Automation of data processing with VBA

- Range Object
- Cell Property
- Offset property ...

**14<sup>th</sup> week: VBA 6.**

**Lecture:** Data security (examples of symmetric and asymmetric cyphers)

**Practice:** Practising for the Endterm test

- Return
- Call

15<sup>th</sup> week: 2<sup>nd</sup> drawing week: Endterm test

## Requirements

### A, for a signature:

Regular attendance (Minimum 70 %). Successful accomplishment of homework.

### B. Requirements for the grade:

Grades will be calculated as the average of midterm and endterm tests. Minimum requirements to pass the semester: Minimum 50% on both tests.

## Basics of Aviation I

Subject group: Specific Compulsory Subjects – ATP(A)

Model curriculum number: 25

Code: MK3PPL1R02HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 1<sup>st</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): -

Further courses are built on it: Yes

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

### Topics:

The course teaches the basic knowledge of aviation in order to assist students in understanding 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 applying to them, airlines and airport organizational structures and their main operational documents

By completing both parts of the course, students will have a basic theoretical and practical knowledge necessary for the first summer flying where they will 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

<b>1<sup>st</sup> week Registration week</b>	
<b>2<sup>nd</sup> week:</b> <b>Practice:</b> Basics of Air Law: Conventions, Agreements, Organizations	<b>3<sup>rd</sup> week:</b> <b>Practice:</b> Basics of Air Law: Airworthiness of aircraft, Aircraft nationality and Registration marks, Personnel licensing
<b>4<sup>th</sup> week:</b> Basics of Air Law: Rules of the air, Air Traffic Services and Air Traffic Management	<b>5<sup>th</sup> week:</b> <b>Practice:</b> Basics of Air Law: Aerodromes
<b>6<sup>th</sup> week:</b> <b>Practice:</b> Basics of Operational Procedures: General Requirements I.	<b>7<sup>th</sup> week:</b> <b>Practice:</b> Basics of Operational Procedures: General Requirements II.
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	
<b>9<sup>th</sup> week:</b> <b>Practice:</b> Basics of Operational Procedures: Special operational procedures and hazards	<b>10<sup>th</sup> week:</b> <b>Practice:</b> Basics of Human Performance and Limitations: Human factors I.
<b>11<sup>th</sup> week:</b> <b>Practice:</b> Basics of Human Performance and Limitations: Human factors II.	<b>12<sup>th</sup> week:</b> <b>Practice:</b> Basics of Human Performance and Limitations: Basics of flight psychology
<b>13<sup>th</sup> week:</b> <b>Practice:</b> Basics of Human Performance and Limitations: Basic aviation psychology	<b>14<sup>th</sup> week:</b> <b>Practice:</b> Basics of Human Performance and Limitations: First aid
<b>15<sup>th</sup> week: 2<sup>nd</sup> drawing week</b>	

**Requirements**

**A, for a signature:**

For the general rules for ATO course, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

**B, for grade:**

For the general rules for ATO course, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

**Theoretical Knowledge of Airline Transport Pilot Licence I (ATPL)**

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 26

Code: MK3TKA1R03HX17-EN

ECTS Credit Points: 3

Evaluation: mid-semester grade

Year, Semester: 1<sup>st</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): -

Further courses are built on it: Yes

Number of teaching hours/week (lecture + practice): 6+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 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  $C_l$ , the drag coefficient  $C_d$ , 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 aims to contribute to the achievement of safe flight during their proposed pilot career. It is crucial for a pilot to be able to recognize hazards during a flight and to apply the right procedures in such cases.

**Literature:**

*Compulsory:*

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

## Schedule

<b>1<sup>st</sup> week Registration week</b>	
<b>2<sup>nd</sup> week:</b> <b>Lecture and Practice:</b> Basics, laws and definitions	<b>3<sup>rd</sup> week:</b> <b>Lecture and Practice:</b> The atmosphere
<b>4<sup>th</sup> week:</b> <b>Lecture and Practice:</b> Basic Aerodynamic theory	<b>5<sup>th</sup> week:</b> <b>Lecture and Practice:</b> Subsonic airflow
<b>6<sup>th</sup> week:</b> <b>Lecture and Practice:</b> Lift	<b>7<sup>th</sup> week:</b> <b>Lecture and Practice:</b> Drag
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	
<b>9<sup>th</sup> week:</b> <b>Lecture and Practice:</b> Stall	<b>10<sup>th</sup> week:</b> <b>Lecture and Practice:</b> $C_{Lmax}$ augmentation
<b>11<sup>th</sup> week:</b> <b>Lecture and Practice:</b> High lift devices	<b>12<sup>th</sup> week:</b> <b>Lecture and Practice:</b> Airframe contamination
<b>13<sup>th</sup> week:</b> <b>Lecture and Practice:</b> Propellers	<b>14<sup>th</sup> week:</b> <b>Lecture and Practice:</b> Summary and revision questions
<b>15<sup>th</sup> week: 2<sup>nd</sup> drawing week</b>	

## Requirements

### A, for a signature:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

### B, for grade:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

## 2nd semester

### Mathematics II

Subject group: Basic Natural Sciences – Faculty of Engineering

Model curriculum number: 2

Code: MK3MAT2A06GX17\_EN, MK3MAT2A06EX17\_EN, MK3MAT2A06RX17\_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

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

#### Topics:

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

Part A: Differentiation and integration of multivariable vector-valued functions (2 hours lecture+2 hours practise/week): Metric, topology, sequences in the space. Linear functions. Parametric curves. Notions of differentiation, linear approximation, curvature, torsion. Parametric surfaces, tangent plane, linear approximation. Surfaces of revolution, ruled surfaces. Scalar field, gradient. Young's theorem. Directional derivative. Local and global extrema. Vector fields. Derivatives. Divergence and curl. Potential function. The notion of double and triple integrals on 2 and 3 dimensional intervals. The extensions of the integrals. Integrals over general regions. The arc length of curves, surface area. Line and surface integrals. The theorems of Gauss and Stokes, Green's formulae. Applications in physics.

Part B: Differential equations (2-hour practice/week): Notions of differential equations, classification of differential equations, initial value problem. Problems leading to differential equations. First order linear differential equations (homogeneous and inhomogeneous, method of variation). Determination of solutions of inhomogeneous first order linear differential equations. Higher order linear differential equations. Solution of linear homogeneous differential equations of order two having constant coefficients. Method of undetermined coefficients. Special second order differential equations. The Laplace transform and its applications. Slope fields, numerical methods. (Euler, Runge-Kutta).

#### Literature:

Required:

Recommended:

- 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

Recommended textbook:

## Schedule

### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

##### Lecture:

Part A: Metric, topology, sequences in  $\mathbb{R}^n$ .

##### Practice:

Part A: Limits of vector sequences

Part B: Notions of differential equations

#### 4<sup>th</sup> week:

##### Lecture:

Part A: Parametric curves II.

##### Practice:

Part A: Curvature, torsion

Part B: First order linear differential equations

#### 6<sup>th</sup> week:

##### Lecture:

Part A: Parametric surfaces

##### Practice:

Part A: Surfaces of revolution

#### 3<sup>rd</sup> week:

##### Lecture:

Part A: Parametric curves I.

##### Practice:

Part A: Differentiation.

Part B: Problems leading to differential equations.

#### 5<sup>th</sup> week:

##### Lecture:

Part A: Differentiable functions of type  $\mathbb{R}^n \rightarrow \mathbb{R}^m$ .

##### Practice:

Part A: Derivatives of functions of type  $\mathbb{R}^n \rightarrow \mathbb{R}^m$ .

Part B: Higher order linear differential equations.

#### 7<sup>th</sup> week:

##### Lecture:

Part A: Scalar field, gradient. Young's theorem. Directional derivative.

##### Practice:

Part B: Solution of linear homogeneous differential equations of order two having constant coefficients

Part A: The domains of functions of type  $\mathbb{R}^2 \rightarrow \mathbb{R}$ . Directional derivative and gradient.

Part B: Summary, sample test

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Lecture:**

Part A: Local and global extrema

**Practice:**

Part A: Local extremas of functions of type  $\mathbb{R}^2 \rightarrow \mathbb{R}$ ,  $\mathbb{R}^3 \rightarrow \mathbb{R}$ .

Part B: Method of undetermined coefficients

**11<sup>th</sup> week:**

**Lecture:**

Part A: Double and triple integrals

**Practice:**

Part A: Integrals on 2 and 3 dimensional intervals

Part B: Laplace transform

**13<sup>th</sup> week:**

**Lecture:**

Part A: Line and surface integrals.

**Practice:**

Part A: arc length of curves, surface area. Line and surface integrals

Part B: Potential functions

**10<sup>th</sup> week:**

**Lecture:**

Part A: Vector fields

**Practice:**

Part A: Vector fields

Part B: Special second order differential equations.

**12<sup>th</sup> week:**

**Lecture:**

Part A: Integrals over general regions

**Practice:**

Part A: Applications

Part B: Slope fields, numerical methods.

**14<sup>th</sup> week:**

**Lecture:**

Part A: Mathematical software

**Practice:**

Part A: Summary, sample test

Part B: Summary, sample test

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

**Requirements**

**A, for a signature and mid-semester grade:**

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.

The final grade can be obtained in the following way:

- students write a mid-term test (Test I, B) from differential equation part of the material in the first drawing week; maximum 30 points can be achieved
- students write a mid-term test (Test I, A) from the differential and integral calculus part of the material in the first drawing week; maximum 50 points can be achieved
- students write an end-term test (Test II, B) from the differential equation part of the material in the second drawing week; maximum 30 points can be achieved
- students write an end-term test (Test II, A) from the differential and integral calculus part of the material in the second drawing week; maximum 50 points can be achieved

Mark ranges after the four tests:

144-160 points: excellent (5)

128-143 points: good (4)

104-127 points: satisfactory (3)

80-103 points: sufficient (2)

0-79 points: insufficient (1)

Those who fail, or do not accept their marks, can write a Test in any of the first three weeks of the exam period. This Test is a combination of the previous four tests, maximum 80 points can be achieved, and the mark ranges are proportional to the above table.

For exam dates check the Neptun system. If someone does not accept her/his mark, it is possible to get any mark (better, the same, or worse) than the original mark by writing this Test.

## **Mathematics Comprehensive Exam**

Subject group: Basic Natural Sciences – Faculty of Engineering

Model curriculum number: 3

Code: MK3MATSA00RX17-EN

ECTS Credit Points: 0

Evaluation: exam

Year, Semester: 1<sup>th</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): Mathematics I, Mathematics II at the same time

Further courses are built on it: No

Subjects of the comprehensive exam: Mathematics I and II

## **Dynamics and Vibrations**

Subject group: Basic Natural Sciences – Faculty of Engineering

Model curriculum number: 6

Code: MK3MREZG04XX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 1<sup>st</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): Engineering Physics, Mathematics I

Further courses are built on it: 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, the 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**

<b>1<sup>st</sup> week Registration week</b>	
<p><b>2<sup>nd</sup> week:</b>  <b>Lecture: Kinematics of a particle</b>                  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.  <b>Practice:</b> Particle kinematics problems</p> <p><b>4<sup>th</sup> week:</b>  <b>Lecture: Kinetics of a particle II</b>                  Formulas for work and potential energy in homogeneous and central force fields. Motion of the particle in gravitational and elastic spring force fields. Constrained</p>	<p><b>3<sup>rd</sup> week:</b>  <b>Lecture: Kinetics of a particle I</b>                  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.  <b>Practice:</b> Particle kinetics problems</p> <p><b>5<sup>th</sup> week:</b>  <b>Lecture: Kinematics of a rigid body I</b>                  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</p>

motion along a two or three-dimensional curve.

**Practice:** Particle kinetics problems II

**6<sup>th</sup> 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

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> 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

**11<sup>th</sup> 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.

**13<sup>th</sup> week:**

**Lecture:** Investigation and properties of the forced vibrations of single DOF undamped

rigid body undergoing translational, rotational and general plane motion. Instantaneous centre of zero velocity, acceleration, and procedure for the determination of them with calculation and construction.

**Practice:** Rigid body kinematics problems

**7<sup>th</sup> 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

**10<sup>th</sup> 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.

**12<sup>th</sup> 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.

**14<sup>th</sup> week:**

**Lecture:** Multiple DOF systems: introduction, basic properties, natural

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.

frequencies and modes, modal transform and decoupling.

**Practice:** Calculation problems related to the free and forced vibrations of multiple DOF undamped and damped systems.

**15<sup>th</sup> week: 2<sup>nd</sup> 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 counts as 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 cannot 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 II

Subject group: Basic Natural Sciences – Faculty of Engineering

Model curriculum number: 8

Code: MK3THE2R04HX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 1<sup>st</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): Thermodynamics and Fluid Mechanics I

Further courses are built on it: 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. Wing profile. Mach number. Principles of flights. 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**

1 <sup>st</sup> week Registration week	
<p><b>2<sup>nd</sup> week:</b> Introduce concepts, principles, laws, observations, and models of fluids at rest and in motion</p> <p><b>Lecture:</b> Provide basis for understanding fluid behavior and for engineering design and control of fluid systems.</p> <p><b>Practice:</b> Solving problems in the theme of the lecture</p>	<p><b>3<sup>rd</sup> week:</b></p> <p><b>Lecture:</b> Develop competence with mass balances for determining resultant interactions of flows and engineered and natural systems.</p> <p><b>Practice:</b> Solving problems in the theme of the lecture</p>
<p><b>4<sup>th</sup> week:</b></p> <p><b>Lecture:</b> Develop competence with energy balances for determining resultant interactions of flows and engineered and natural systems.</p>	<p><b>5<sup>th</sup> week:</b></p> <p><b>Lecture:</b> Develop competence with momentum balances for determining resultant interactions of flows and engineered and natural systems.</p>

**Practice:** Solving problems in the theme of the lecture

**6<sup>th</sup> 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

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Lecture:** Learn nature of rotation, circulation, resistance (viscous, turbulent), boundary layers, and separation with applications to drag and lift on objects. Mach number

**Practice:** Solving problems in the theme of the lecture

**11<sup>th</sup> week:**

**Lecture:** Navier- Stokes equation

**Practice:** Solving problems in the theme of the lecture.

**13<sup>th</sup> week:**

**Lecture:** Bernoulli equation. Wing profile.

**Practice:** Solving problems in the theme of the lecture

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

**Practice:** Solving problems in the theme of the lecture

**7<sup>th</sup> week:**

**Lecture, practice:** Solving problems in the theme of the lecture

**10<sup>th</sup> week:**

**Lecture:** Learn methods for computing headlosses and flows in simple pipes and channels.

**Practice:** Solving problems in the theme of the lecture

**12<sup>th</sup> week:**

**Lecture:** Losses in pipes. Dag. Lift.

**Practice:** Solving problems in the theme of the lecture

**14<sup>th</sup> week:**

**Lecture:** Law of impulse and momentoum.

**Practice:** Solving problems in the theme of the lecture

## 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 cannot 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 more than three absences, a medical certificate needs to be presented. Missed practices should be made up for at a later date previously 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 does not 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 0.7 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);

## **Aviation Terminology II**

Subject group: Economics and Humanities – Faculty of Engineering

Model curriculum number: 15

Code: MK3AVT3R01HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 1<sup>st</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): Aviation Terminology I

Further courses are built on it: No

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

### **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. Runway incursion, airport layout, ground operations
2. Co-ordinates, topographical features
3. Technology: datalink, flight control systems, instrument panel
4. Animals: wildlife on the ground, animals on the loose, bird strike
5. Gravity: manoeuvring an aircraft, hydraulic loss
6. Health: medical emergencies

7. Fire, on-board fire
8. Meteorology
9. Landings
10. Fuel
11. Pressure: blast, emergency descent
12. Security

**Literature:**

*Compulsory:*

Sue Ellis-Terence Gerighty: English for Aviation for Pilots and Air Traffic Controllers. Express Series. Oxford Business English. OUP. 2008. ISBN: 978 0 19 457943 8

Philip Shawcross: Flightpath, Aviation English for Pilots and ATCos. Cambridge Professional English. CUP. 2011. ISBN: 978-0521178716

*Recommended:*

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

**Schedule**

<b>1st week Registration week</b>	
<p><b>2<sup>nd</sup> week:</b>  <b>Practice:</b> Avoiding miscommunication, asking for information, airport layout. Ground operations, describing actions and position.</p> <p><b>4<sup>th</sup> week:</b>  <b>Practice:</b> Technology: datalink, flight control systems. The instrument panel, instrument blackout.</p> <p><b>6<sup>th</sup> week:</b>  <b>Practice:</b> Gravity: manoeuvring an aircraft, comparing and contrasting. Aerobatics: units of measurement, hydraulic loss.</p>	<p><b>3<sup>rd</sup> week:</b>  <b>Practice:</b> Explaining abbreviations, co-ordinates words. Confirming and disconfirming, topographical features.</p> <p><b>5<sup>th</sup> week:</b>  <b>Practice:</b> Animals: wildlife on the ground, animals on the loose. Bird strike, cargo words.</p> <p><b>7<sup>th</sup> week:</b>  <b>Practice:</b> Health: medical emergencies vocabulary. Symptoms of stress, making suggestions and giving advice.</p>
<b>8th week: 1st drawing week</b>	
<p><b>9<sup>th</sup> week:</b>  <b>Practice:</b> Fire: words for describing fire, collocations related to fire. On-board fire: identifying and responding problems, electrical problems vocabulary.</p> <p><b>11<sup>th</sup> week:</b>  <b>Practice:</b> Landings: touchdown, describing sensory impressions, landing gear and</p>	<p><b>10<sup>th</sup> week:</b>  <b>Practice:</b> Meteorology: microburst. Airport disruption, weather words.</p> <p><b>12<sup>th</sup> week:</b></p>

braking words. Describing 3-D position and movement, undercarriage: resolving misunderstanding.

**13<sup>th</sup> week:**

**Practice:** Pressure: blast, emergency descent. Damage, types of damage, expressing consequences.

**Practice:** Aviation and global warming, suggesting solutions to problems. Fuel icing, fuel collocations.

**14<sup>th</sup> week:**

**Practice:** Security: air rage, focusing on actions. Suspicious passengers, words for strange behaviour, unlawful interference.

**15th week: 2nd drawing week**

## Requirements

### A, for a signature:

Participation at **practice classes** is compulsory. Students must attend the practice classes and may not miss more than three classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students cannot make up any practices with other groups. Attendance at practice classes will be recorded by the practice leader. Being late counts as an absence. In case of more than three absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date previously discussed with the tutor.

### B, for grade:

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

## Aircraft Technology

Subject group: Professional Compulsory Subjects – Faculty of Engineering

Model curriculum number: 17

Code: MK3AIRCRO4HX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 1<sup>st</sup> year, 2<sup>nd</sup> semester

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

Further courses are built on it: Yes

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 II subjects.

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 completing the course, students will gain a basic knowledge necessary 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 Commission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course aims to contribute to the achievement of safe flight during their proposed pilot career. It is crucial for a pilot to be able to recognize hazards during a flight and to apply the right procedures in such cases.

**Literature:**

*Compulsory:*

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

**Schedule**

<b>1<sup>st</sup> week Registration week</b>	
<p><b>2<sup>nd</sup> week:</b>  <b>Lecture:</b> Systems, loads, stress, maintenance, Structure  <b>Practice:</b> Lab demonstration, Loads and stresses</p> <p><b>4<sup>th</sup> week:</b>  <b>Lecture:</b> Hydraulic, Hydraulic systems, Nose wheel steering: structure and operation  <b>Practice:</b> Lab demonstration, hydraulic fluids</p> <p><b>6<sup>th</sup> week:</b>  <b>Lecture:</b> Controls, Secondary controls, De-ice systems, Fuel systems  <b>Practice:</b> Site visit, aircraft demonstration</p>	<p><b>3<sup>rd</sup> week:</b>  <b>Lecture:</b> Wings, empennage, control surfaces, Fuselage, doors, floor, windshield, windows, Control surface types  <b>Practice:</b> Site visit, aircraft demonstration</p> <p><b>5<sup>th</sup> week:</b>  <b>Lecture:</b> Brakes, Wheels and tyres  <b>Practice:</b> Lab demonstration, simplified systems</p> <p><b>7<sup>th</sup> week:</b>  <b>Lecture:</b> Electric systems basics, Battery, Static electricity: general, Electric parts, Distribution  <b>Practice:</b> Lab demonstration and examples</p>

### 8<sup>th</sup> week: 1<sup>st</sup> drawing week

#### 9<sup>th</sup> week:

**Lecture:** Piston engines: general, Fuel, Carburetor and injector systems, Air conditioning

**Practice:** Site visit, aircraft demonstration

#### 11<sup>th</sup> week:

**Lecture:** Propellers

**Practice:** Performance examples

#### 13<sup>th</sup> week:

**Lecture:** Performance aspects

**Practice:** Performance examples

### 15<sup>th</sup> week: 2<sup>nd</sup> drawing week

#### 10<sup>th</sup> week:

**Lecture:** Lubrication, Ignition, Mixture

**Practice:** Lab demonstration

#### 12<sup>th</sup> week:

**Lecture:** Gas turbine engines: general, Fuel (jet), Engine components, Further components and systems

**Practice:** Site visit, aircraft demonstration

#### 14<sup>th</sup> week:

**Lecture:** Detection and protection systems, Other systems

**Practice:** Operations presentation

## Requirements

### A, for a signature:

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

Participation at **practice classes** is compulsory. Students must attend the practice classes and may not miss more than three classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students cannot make up any practices with other groups. Attendance at practice classes will be recorded by the practice leader. Being late counts as an absence. In case of more than three absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date previously discussed with the tutor.

### B, for grade:

The course ends in an examination.

## Basics of Aviation II

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 27

Code: MK3PPL2R03HX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 1<sup>st</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): Basics of Aviation I

Further courses are built on it: Yes

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

**Topics:**

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

By completing Part II of the course, students will be acquainted with airport and airline environments, training regulations, dispatch procedures, pre-flight planning, training aircrafts, and post flight requirements including logbook maintenance and emergency procedures. In the first flight training hours, students will become familiar with the training aircraft, its operating characteristics, flight controls, basic instruments and system, general good operating techniques and safety procedures. After completing the course, students shall be able to conduct a pre-flight with assistance, 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. They will be 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 completing both parts of the course, students will have a basic theoretical and practical knowledge necessary for the first summer flying where they will have the opportunity to make an intense flight programme.

**Literature:**

*Recommended:*

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

**Schedule**

<b>1<sup>st</sup> week Registration week</b>	
<b>2<sup>nd</sup> week:</b> <b>Practice:</b> Basics of Instrumentation: Sensors and instruments, Measurement of air data parameters, Gyroscopic instruments	<b>3<sup>rd</sup> week:</b> <b>Practice:</b> Basics of Mass and Balance: Purpose of Mass and Balance considerations, Loading, Fundamentals of CG calculations
<b>4<sup>th</sup> week:</b>	<b>5<sup>th</sup> week:</b>

**Practice:** Basics of Mass and Balance: Mass and Balance details of aircraft, determination of CG position

**6<sup>th</sup> week:**

**Practice:** Basics of Performance: Single engine airplanes

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Practice:** Basics of Flight planning and monitoring: Fuel planning

**11<sup>th</sup> week:**

**Practice:** Basics of Radio Navigation: Basic radar principles, Radio aids

**13<sup>th</sup> week:**

**Practice:** Basics of Meteorology: The atmosphere, Wind, Thermodynamics

**Practice:** Basics of Performance: General

**7<sup>th</sup> week:**

**Practice:** Basics of Flight planning and monitoring: Flight planning for VFR flights

**10<sup>th</sup> week:**

**Practice:** Basics of General Navigation: Basics of navigation, magnetism and compasses, Charts

**12<sup>th</sup> week:**

**Practice:** Basics of VFR Communication: Definitions, General operating procedures, Distress and Urgency procedures

**14<sup>th</sup> week:**

**Practice:** Basics of Meteorology: Clouds and fog, Precipitation, Flight hazards, Meteorological information

## Requirements

### A, for a signature:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

### B, for grade:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

## Theoretical Knowledge of Airline Transport Pilot Licence II (ATPL)

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 28

Code: MK3TKA2R02HX17-EN

ECTS Credit Points: 1

Evaluation: mid-semester grade

Year, Semester: 1<sup>st</sup> year, 2<sup>nd</sup> semester

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

Further courses are built on it: Yes

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  $C_m-\alpha$  graph,  $C_n-\beta$  graph,  $C_l-\beta$  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

**1<sup>st</sup> week Registration week**

**2<sup>nd</sup> week:**

**Lecture:** Static stability

**6<sup>th</sup> week:**

**Lecture:** Dynamic lateral stability

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Lecture:** Control - General

**11<sup>th</sup> week:**

**Lecture:** Roll (lateral) control

**3<sup>rd</sup> week:**

**Lecture:** Dynamic stability

**7<sup>th</sup> week:**

**Lecture:** Dynamic directional stability

**10<sup>th</sup> week:**

**Lecture:** Pitch (longitudinal) control

**12<sup>th</sup> week:**

**Lecture:** Means to reduce control forces

**13<sup>th</sup> week:**

**Lecture:** Mass Balance

**14<sup>th</sup> week:**

**Lecture:** Trimming

**15<sup>th</sup> week:** 2<sup>nd</sup> drawing week

## Requirements

### A, for a signature:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

### B, for grade:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

## Meteorology I (ATPL)

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 29

Code: MK3MET1R02HX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 1<sup>st</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): -

Further courses are built on it: Yes

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

### Topics:

The course (Part I and II together) teaches the basic knowledge of Meteorology 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 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 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), Meteorology, 2015, ISBN: 978 1 90620 272 9

### Schedule

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> 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

#### 4<sup>th</sup> 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

#### 6<sup>th</sup> week:

**Lecture:** Thermodynamics, Humidity, Water vapour in the atmosphere, Mixing ratio, Temperature/dew point, relative humidity, Change of state of aggregation,

#### 3<sup>rd</sup> 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

#### 5<sup>th</sup> week:

**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

#### 7<sup>th</sup> week:

**Lecture:** Clouds and fog, Cloud formation and description, Cloud types and cloud classification, Influence of inversions on

Condensation, evaporation, sublimation, freezing and melting, latent heat, Adiabatic processes, Adiabatic processes, stability of the atmosphere

**Practice:** Case studies on thermodynamics

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> 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

**11<sup>th</sup> 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

**13<sup>th</sup> 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

**Practice:** Case studies on air masses and fronts

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

cloud development, Flying conditions in each cloud type

**Practice:** Classification examples

**10<sup>th</sup> week:**

**Lecture:** Precipitation, Development of precipitation, Types of precipitation, relationship with cloud types

**Practice:** Airport meteorological center site visit

**12<sup>th</sup> 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

**14<sup>th</sup> 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, polar and secondary depressions; troughs, Tropical revolving storms,

**Practice:** Case studies on storms

**Requirements**

**A, for a signature:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

**B, for grade:**



For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

### **Communication VFR (ATPL)**

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 30

Code: MK3COMVR01HX20-EN

ECTS Credit Points: 1

Evaluation: authority exam

Year, Semester: 1st year, 2nd semester

Its prerequisite(s): -

Further courses are built on it: No

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

#### **Topics:**

The course teaches the basic knowledge of Communication VFR 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, 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**

**1<sup>st</sup> week Registration week**

**2<sup>nd</sup> week:**

**3<sup>rd</sup> week:**

**Lecture:**

VFR COMMUNICATIONS, CONCEPTS

*Associated terms:*

Meanings and significance

Air Traffic Services abbreviations,

**Practice:** practical examples

**4<sup>th</sup> week:**

**Lecture:**

VFR COMMUNICATIONS, GENERAL OPERATING PROCEDURES

*Transmission standards:*

Transmission of letters

Transmission of numbers

Transmission of time

**Practice:** practical examples

**6<sup>th</sup> week:**

**Lecture:**

VFR COMMUNICATIONS, GENERAL OPERATING PROCEDURES

*Transmission standards:*

RT call signs for aeronautical stations including use of abbreviated call signs

**Practice:** practical examples

**Lecture:**

VFR COMMUNICATIONS, CONCEPTS

*Associated terms:*

Q-code groups commonly used in radiotelephony (RT) air – ground communications,

Categories of messages

**Practice:** practical examples

**5<sup>th</sup> week:**

**Lecture:**

VFR COMMUNICATIONS, GENERAL OPERATING PROCEDURES

*Transmission standards:*

Transmission techniques

Standard words and phrases (relevant RTF phraseology included)

**Practice:** practical examples

**7<sup>th</sup> week:**

**Lecture:**

VFR COMMUNICATIONS, GENERAL OPERATING PROCEDURES

*Transmission standards:*

RT call signs for aircraft including use of abbreviated call signs

Transfer of communication

Test procedures including readability scale

**Practice:** practical examples

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Lecture:**

VFR COMMUNICATIONS, GENERAL OPERATING PROCEDURES

*Transmission standards:*

Read-back and acknowledgement requirements

**10<sup>th</sup> week:**

**Lecture:**

VFR COMMUNICATIONS, RELEVANT WEATHER INFORMATION

*Aerodrome weather:*

Aerodrome weather terms, Weather broadcast

Radar procedural phraseology  
Level changes and reports  
Data link messages  
**Practice:** practical examples

**11<sup>th</sup> week:**

**Lecture:**

VFR COMMUNICATIONS, VOICE  
COMMUNICATION FAILURE

*Required action:*

Action required to be taken in case of  
communication failure

**Practice:** practical examples

**13<sup>th</sup> week:**

**Lecture:**

VFR COMMUNICATIONS, VHF  
PROPAGATION AND ALLOCATION OF  
FREQUENCIES

*General Principles:*

Spectrum, bands, range

**Practice:** practical examples

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

**Requirements**

**A, for a signature:**

For the general rules for ATO courses, refer to the effective version of "Training Guidance for Professional Pilot BSc Students". The guidance is available on the university website and the ATO online administrative interface.

**B, for grade:**

For the general rules for ATO courses, refer to the effective version of "Training Guidance for Professional Pilot BSc Students". The guidance is available on the university website and the ATO online administrative interface.

**Practice:** practical examples

**12<sup>th</sup> week:**

**Lecture:**

VFR COMMUNICATIONS, DISTRESS AND  
URGENCY PROCEDURES

*Signals and procedures:*

Distress

Urgency

**Practice:** practical examples

**14<sup>th</sup> week:**

**Lecture:**

VFR COMMUNICATIONS, OTHER  
COMMUNICATIONS

*Weather observations, Morse code:*

Meteorological observations,

Use of Morse code

**Practice:** practical examples

## Electrotechnics and Electronics

Subject group: Basic Natural Sciences – Faculty of Engineering

Model curriculum number: 9

Code: MK3ELTER06RX17-EN

ECTS Credit Points: 6

Evaluation: mid-semester grade

Year, Semester: 2<sup>nd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): Mathematics I, Engineering Physics

Further courses are built on it: Yes

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

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

**Lecture:** Electrostatics, DC networks: basic electrical concepts of electric charge, electric current (amperage), electric field,

#### 3<sup>rd</sup> week:

**Lecture:** Power source (ideal real), Power Source (ideal for real), Consumer, Ohm's Law, Resistance - design, characteristic data, division, marking according to IEC

electric field work, electric voltage (potential), electric circuit

**Practice:** General description, laboratory regulations, Safety regulations and safety instruction

#### 4<sup>th</sup> 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, R, P) using Ohm's Law. Measuring the values of DC circuit. Using Kirchhoff's laws. Report writing.

#### 6<sup>th</sup> 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.

#### 8<sup>th</sup> week: 1<sup>st</sup> drawing week

#### 9<sup>th</sup> 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.

#### 11<sup>th</sup> week:

**Lecture:** Bipolar transistor structure, gain, transistor parameters and characteristics, the FE connection, adjusting the set point.

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)

#### 5<sup>th</sup> week:

**Lecture:** Network analysis: superposition theory, Norton and Thevenin theory.

**Practice:** Perform a complex DC measurement and calculation task. Report writing.

#### 7<sup>th</sup> week:

**Lecture:** Performance of AC circuits, power factor correction, Three-phase systems

**Practice:** measurements of AC power. Report writing.

#### 10<sup>th</sup> 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.

#### 12<sup>th</sup> week:

**Lecture:** Principles of operation of field-effect transistors.

Areas of application of bipolar transistor, circuits transistor basic (CB, CC circuits),

**Practice:** Analysis of common emitter basic circuit. Report writing.

**13<sup>th</sup> week:**

**Lecture:** Operation and characteristics of basic operational amplifier circuits (inverting, non-inverting, follower, summing, differential, differentiator and integrator basic circuit)

**Practice:** Analysis of summing operational amplifier basic circuit. Report writing.

**Practice:** Analysis of common source basic circuit. Report writing.

**14<sup>th</sup> week:**

**Lecture:** Filters: Low and high pass filter, band pass filter.

**Practice:** Analysis of filters basic circuit. Report writing.

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

## Requirements

### A, for a signature:

Attendance at lectures is recommended, but not compulsory. Participation at practice classes is compulsory. Students must attend the practice classes and may not miss more than three classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student cannot make up a practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late counts as 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 does not 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)

## Descriptive Geometry

Subject group: Professional Compulsory Subjects – Faculty of Engineering

Model curriculum number: 18

Code: MK3DEGRR04HX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 2<sup>nd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): -

Further courses are built on it: 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 the 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

1 <sup>st</sup> week Registration week	
<b>2<sup>nd</sup> week:</b> <b>Practice:</b> Axonometry, perspective; Introduction to multiview projection	<b>3<sup>rd</sup> week:</b> <b>Practice: Introduction to the Monge's method of projecting</b> 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
<b>4<sup>th</sup> week:</b> <b>Practice: Points and lines in the plane</b> Line in a plane, point in a plane First mainline and second mainline in a plane Point in a first/second projecting plane	<b>5<sup>th</sup> week:</b> <b>Practice: Intersection of a line with the plane</b> Intersection of a line with the projecting plane Intersection of a line with the plane (in general position). Visibility

**6<sup>th</sup> 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

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Practice: Metric tasks I. Determining distances and angles of the objects**

Distance between two points. Length 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

**11<sup>th</sup> week:**

**Practice: Intersection of the polyhedrons with lines and planes**

Prisms and pyramids

**13<sup>th</sup> week:**

**Practice: Intersection of two polyhedrons II.**

Intersection of prisms and pyramids

**7<sup>th</sup> 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

**10<sup>th</sup> 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.

**12<sup>th</sup> week:**

**Practice: Intersection of two polyhedrons I.**

Intersection of prisms and pyramids

**14<sup>th</sup> week:**

**Practice: Curved surfaces (Cylinders, Cones, Spheres)**

Intersection of the Curved surfaces with planes. Development of a curved surfaces and intersections, Kochanski's Approximation.

**15<sup>th</sup> week: 2<sup>nd</sup> 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

Subject group: Professional Compulsory Subjects – Faculty of Engineering

Model curriculum number: 19

Code: MK3MGEPG04RX17-EN

ECTS Credit Points: 4

Evaluation: exam

Year, Semester: 2<sup>nd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): Aircraft Technology

Further courses are built on it: 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 movers, 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](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

### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

**Lecture:** Tolerance and fit systems

**Practice:** Calculation of tolerance types and fits

#### 4<sup>th</sup> week:

**Lecture:** Linkage mechanisms, types of constraints. Statically determinate, indeterminate and unstable constructions

**Practice:** Analyzing linkage mechanisms: suspension systems of vehicles and airplanes.

#### 6<sup>th</sup> 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.

### 8<sup>th</sup> week: 1<sup>st</sup> drawing week

#### 9<sup>th</sup> week:

**Lecture:**

Seals, operation principles. Contacting and non-contacting seals and their application fields.

#### 3<sup>rd</sup> week:

**Lecture:** Set-up of a machine group, operation and operation requirements

**Practice:** Characteristics and operation features of prime movers, machines and precondition of stable running

#### 5<sup>th</sup> 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.

#### 7<sup>th</sup> week:

**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.

#### 10<sup>th</sup> week:

**Lecture:** Clutches and couplings. Types, operation features, application fields.

**Practice:** Stiff, flexible and universal joints. Introduction in lab and choosing from catalogues.

**Practice:** Showing the different types of seals, choosing them from brand catalogues.

**11<sup>th</sup> week:**

**Lecture:** Heat balance of braking. Types of brakes, actuation of them, operation method.

**Practice:** Showing brakes. Analyzing the operation of them.

**13<sup>th</sup> week:**

**Lecture:** Types of chain drives, operation features, application fields.

**Practice:** Sprocket and chain constructions. Design of chain drive, applying design charts.

**12<sup>th</sup> week:**

**Lecture:** Types of belt drives, operation features, application fields.

**Practice:** Pulley constructions, belt sections, design of belt drive, applying design charts.

**14<sup>th</sup> week:**

**Lecture:**

Types of gear drives. Operation and their application fields.

**Practice:**

Explanations of gear drive constructions. Ratio calculation.

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

## Requirements

### A, for a signature:

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

Participation at **practice classes** is compulsory. Students must attend the practice classes and may not miss more than three classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. Students cannot make up any practices with other groups. Attendance at practice classes will be recorded by the practice leader. Being late counts as an absence. In case of more than three absences, a medical certificate needs to be presented. Missed practice classes should be made up for at a later date previously 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 does not 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 8<sup>th</sup> week and the end-term test in the 15<sup>th</sup> 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.

## **Mechatronic Devices (Sensors, Actuators, Motors)**

Subject group: Professional Compulsory Subjects – Faculty of Engineering

Model curriculum number: 20

Code: MK3ERZBR04RX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 2<sup>nd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): Engineering Physics

Further courses are built on it: Yes

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

<b>1<sup>st</sup> week Registration week</b>	
<b>2<sup>nd</sup> week:</b> <b>Lecture:</b> Definition, types of sensors, main error sources of transducers. <b>Practice:</b> Application of ultrasonic distance sensor.	<b>3<sup>rd</sup> week:</b> <b>Lecture:</b> Static and dynamic sensor characteristics, environmental impacts on characteristics. <b>Practice:</b> Application of pressure sensor.
<b>4<sup>th</sup> week:</b> <b>Lecture:</b> Position sensors. <b>Practice:</b> Application of color sensors.	<b>5<sup>th</sup> week:</b> <b>Lecture:</b> Level sensors. <b>Practice:</b> Application of level sensors.
<b>6<sup>th</sup> week:</b> <b>Lecture:</b> Flowmeters. <b>Practice:</b> Application of temperature and humidity sensors.	<b>7<sup>th</sup> week:</b> <b>Lecture:</b> High temperature measurement. <b>Practice:</b> Application of gas sensor.
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	
<b>9<sup>th</sup> week:</b> <b>Lecture:</b> Chemical sensors: humidity, gas sensor, etc. <b>Practice:</b> Application of light sensors.	<b>10<sup>th</sup> week:</b> <b>Lecture:</b> Measurement of kinematic quantities. <b>Practice:</b> Application of acceleration sensor.
<b>11<sup>th</sup> week:</b> <b>Lecture:</b> Force and torque measurement. <b>Practice:</b> Application of vibration sensor.	<b>12<sup>th</sup> week:</b> <b>Lecture:</b> Role of actuators, types of actuators. <b>Practice:</b> QNET Mechatronics sensor trainer.
<b>13<sup>th</sup> week:</b> <b>Lecture:</b> Electromechanical Actuators: DC Motors, AC Motors, Linear Motors, Stepper Motors, Midget Motors. <b>Practice:</b> QNET HVAC trainer.	<b>14<sup>th</sup> week:</b> <b>Lecture:</b> Piezoelectric actuators, magnetostriction actuators, magneto hydrodynamic activators, memory metal actuators. <b>Practice:</b> QNET motors trainer.
<b>15<sup>th</sup> week: 2<sup>nd</sup> drawing week</b>	

## Requirements

### A, for a signature:

Attendance at lectures is recommended, but not compulsory. Participation at practice classes is compulsory. Students must attend the practice classes and may not miss more than three classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student cannot make up a practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late counts as 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:

- 1<sup>st</sup> test with 40 points
- 2<sup>nd</sup> test with 40 points
- quality of the measurement reports with 20 points

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

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

## Theoretical Knowledge of Airline Transport Pilot Licence III (ATPL)

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 31

Code: MK3TKA3R02HX17-EN

ECTS Credit Points: 1

Evaluation: authority exam

Year, Semester: 2<sup>nd</sup> year, 1<sup>st</sup> semester

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

Further courses are built on it: 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 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:

Controls, high speed aerodynamics, limitations, maneuvering envelope, gust envelope, flight mechanics, forces acting on an airplane, 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

<b>1<sup>st</sup> week Registration week</b>	
<b>2<sup>nd</sup> week:</b> <b>Lecture and practice:</b> Controls – moments, balancing.	<b>3<sup>rd</sup> week:</b> <b>Lecture and practice:</b> Controls – longitudinal and lateral control
<b>4<sup>th</sup> week:</b> <b>Lecture and practice:</b> Controls – speed brakes, directional control	<b>5<sup>th</sup> week:</b> <b>Lecture and practice:</b> Controls – secondary effects of controls, trimming
<b>6<sup>th</sup> week:</b> <b>Lecture and practice:</b> High speed aerodynamics - speeds	<b>7<sup>th</sup> week:</b> <b>Lecture and practice:</b> High speed aerodynamics - shockwaves
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	
<b>9<sup>th</sup> week:</b> <b>Lecture and practice:</b> High speed aerodynamics – critical Mach number	<b>10<sup>th</sup> week:</b> <b>Lecture and practice:</b> High speed aerodynamics – Buffet and buffet margin
<b>11<sup>th</sup> week:</b> <b>Lecture and practice:</b> Limitations – Manoeuvring envelope	<b>12<sup>th</sup> week:</b> <b>Lecture and practice:</b> Limitations – Gust envelope
<b>13<sup>th</sup> week:</b>	<b>14<sup>th</sup> week:</b>

**Lecture and practice:** Flight mechanics – forces acting on an aeroplane

**Lecture and practice:** Flight mechanics – asymmetric thrust

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

## Requirements

### A, for a signature:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

### B, for grade:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

## Meteorology II (ATPL)

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 32

Code: MK3MET2R02HX17-EN

ECTS Credit Points: 3

Evaluation: authority exam

Year, Semester: 2<sup>nd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): Meteorology I

Further courses are built on it: 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 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:

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 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), Meteorology, 2015, ISBN: 978 1 90620 272 9

### Schedule

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

**Lecture:** Climatology, Climatic zones, General circulation in the troposphere and lower stratosphere, Climatic classification

**Practice:** Climatic classification examples

#### 4<sup>th</sup> 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

#### 6<sup>th</sup> week:

**Lecture:** Flight hazards, Wind shear, Definition of wind shear, Weather

#### 3<sup>rd</sup> 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

#### 5<sup>th</sup> 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

#### 7<sup>th</sup> week:

**Lecture:** Flight hazards, Thunderstorms, Conditions for and process of development, forecast, location, type specification,

conditions for wind shear, Effects on flight, avoidance

**Practice:** Case study, avoidance techniques

Structure of thunderstorms, life history, Electrical discharges, Development and effects of downbursts

**Practice:** Thunderstorm avoidance, Tornadoes, Properties and occurrence

### 8<sup>th</sup> week: 1<sup>st</sup> drawing week

#### 9<sup>th</sup> week:

**Lecture:** Flight hazards, Inversions, Influence on aircraft performance, Stratospheric conditions, Influence on aircraft performance

**Practice:** Aircraft performance influence examples

#### 11<sup>th</sup> week:

**Lecture:** Meteorological Information, Observation, Surface observations, Radiosonde observations, Satellite observations, Weather-radar observations, Aircraft observations and reporting

**Practice:** Airport meteorological center site visit

#### 13<sup>th</sup> 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

#### 10<sup>th</sup> 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

#### 12<sup>th</sup> week:

**Lecture:** Meteorological Information, Weather charts, Significant weather charts, Surface charts, Upper-air charts

**Practice:** Charts examples

#### 14<sup>th</sup> week:

**Lecture:** Meteorological Information, Meteorological services, World area forecast system and meteorological offices, International organisations

**Practice:** Meteorological offices in operation

### 15<sup>th</sup> week: 2<sup>nd</sup> drawing week

## Requirements

A, for a signature:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

**B, for grade:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

## **General Navigation (ATPL)**

Subject group:: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 33

Code: MK3GENAR04HX17-EN

ECTS Credit Points: 4

Evaluation: authority exam

Year, Semester: 2<sup>nd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): -

Further courses are built on it: 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 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:

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 background and basis of aviation, learn the structure and sources of the rules.

**Literature:**

*Compulsory:*

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

## Schedule

### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> 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

**Practice:** Great circle, small circle, Use of latitude and longitude coordinates to locate any specific position

#### 4<sup>th</sup> week:

**Lecture:** Direction (Datums, Track Heading) (True north, Terrestrial magnetism: magnetic north, inclination and variation, Compass deviation, compass north, Isogonals, relationship between true and magnetic north, Gridlines, isogrives

**Practice:** Compass instrument demonstration, Calculation examples

#### 6<sup>th</sup> week:

**Lecture:** Speed (True Airspeed (TAS), Mach number (M), Ground Speed (GS), Flight Log Gradient versus rate of climb/descent, Triangle of velocities (TOV), Ground-speed revision, Off-track corrections, Calculation of wind speed and direction, Estimated Time of Arrival (ETA) revisions)

**Practice:** Units of speed conversion examples

### 8<sup>th</sup> week: 1<sup>st</sup> drawing week

#### 9<sup>th</sup> week:

**Lecture:** Navigation in climb and descent (Average airspeed, Average wind velocity (WV), Ground speed/distance covered during climb or descent, Gradients versus rate of climb/descent

**Practice:** Case studies for in-flight navigation

#### 3<sup>rd</sup> week:

Position (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

#### 5<sup>th</sup> week:

**Lecture:** 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:** Units of distance conversion examples

#### 7<sup>th</sup> 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, Determination of temperature, Determination of appropriate speed, Determination of Mach number)

**Practice:** Calculation examples

#### 10<sup>th</sup> week:

**Lecture:** Visual flight rule (VFR) navigation (Ground Features, VFR navigation techniques

**Practice:** Introduction to flight planning

**11<sup>th</sup> week:**

**Lecture:** Great Circles and Rhumb Lines (Properties and Convergence, relationship (distances and conversion angle))

**Practice:** Calculation examples

**3<sup>th</sup> week:**

**Lecture:** 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

**12<sup>th</sup> week:**

**Lecture:** General properties of miscellaneous types of projections (Direct Mercator, Lambert conformal conic, Polar stereographic)

**Practice:** Practical use

**14<sup>th</sup> week:**

**Lecture:** 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:** Time conversion examples

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week****Requirements****A, for a signature:**

For the general rules for ATO courses, refer to the effective version of "Training Guidance for Professional Pilot BSc Students". The guidance is available on the university website and the ATO online administrative interface.

**B, for grade:**

For the general rules for ATO courses, refer to the effective version of "Training Guidance for Professional Pilot BSc Students". The guidance is available on the university website and the ATO online administrative interface.

## Economics for Engineers

Subject group: Economics and Humanities – Faculty of Engineering

Model curriculum number: 10

Code: MK3KOZMM04XX17-EN

ECTS Credit Points: 2

Evaluation: exam

Year, Semester: 2<sup>nd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): -

Further courses are built on it: Yes

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, Addison Wersley: Pearson. ISBN: 0321248449.

## Schedule

1 <sup>st</sup> week Registration week	
<p><b>2<sup>nd</sup> week:</b></p> <p><b>Lecture:</b> The Scope and Method of Economics</p> <p>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.</p> <p>Calculation/team problems: The circular flow Diagram. Case study examination.</p>	<p><b>3<sup>rd</sup> week:</b></p> <p><b>Lecture:</b> 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).</p> <p>Calculation/team problems: The expenditure approach. The difference between real GDP and nominal GDP. Macroeconomic indicators.</p>
<p><b>4<sup>th</sup> week:</b></p> <p><b>Lecture:</b> 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.</p> <p>Calculation/team problems: Market demand and supply, equilibrium. Two sector model.</p>	<p><b>5<sup>th</sup> week:</b></p> <p><b>Lecture:</b> 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.</p> <p>Calculation/team problems: Fiscal policy and the equilibrium. Average tax rate, tax wedge, and marginal tax rate.</p>
<p><b>6<sup>th</sup> week:</b></p> <p><b>Lecture:</b> 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.</p> <p>Calculation/team problems: Demand and supply in an open economy. Equilibrium output in an Open Economy, net exports.</p>	<p><b>7<sup>th</sup> week:</b></p> <p><b>Lecture:</b> 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.</p> <p>Calculation/team problems: The money multiplier. Fisher effect (nominal and real interest rate).</p>
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	Mid-Term Test I

**9<sup>th</sup> week:**

**Lecture:** The demand for money. Supply and demand in the money market. The equilibrium interest rate. The LM curve. The equilibrium price-level.

**11<sup>th</sup> 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.

**13<sup>th</sup> 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.

**10<sup>th</sup> week:**

**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.

**12<sup>th</sup> week:**

**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.

**14<sup>th</sup> 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.

**15<sup>th</sup> week: 2<sup>nd</sup> 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 cannot take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late counts as 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 7<sup>th</sup> week and the end-term test on the 15<sup>th</sup> 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:

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.

## **Materials Engineering**

Subject group: Professional Compulsory Subjects – Faculty of Engineering

Model curriculum number: 21

Code: MK3ANISG06RX17-EN

ECTS Credit Points: 5

Evaluation: mid-semester grade

Year, Semester: 2<sup>nd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): Aircraft Technology

Further courses are built on it: No

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

**Topics:**

The aim of the course is to give a 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

<b>1<sup>st</sup> week Registration week</b>	
<b>2<sup>nd</sup> week:</b> <b>Lecture:</b> Overview of the groups of engineering materials and presentation of the latest material science results <b>Practice:</b> Preparation of a metallographic sample for semester task	<b>3<sup>rd</sup> week:</b> <b>Lecture:</b> Metals I - overview and presentation of metallic alloys <b>Practice:</b> Preparation of a metallographic sample for semester task
<b>4<sup>th</sup> week:</b> <b>Lecture:</b> Metals II - manufacturing technology of metals <b>Practice:</b> Preparation of a metallographic sample for semester task	<b>5<sup>th</sup> week:</b> <b>Lecture:</b> Metals III – Material testing and qualification <b>Practice:</b> Preparation of a metallographic sample for semester task
<b>6<sup>th</sup> week:</b> <b>Lecture:</b> Metals IV – Theoretical background of metal alloys <b>Practice:</b> Microscopic analysis to complete the semester task	<b>7<sup>th</sup> week:</b> <b>Lecture:</b> Polymer I - Overview of Industrial Polymers, Production Technology <b>Practice:</b> Microscopic analysis to complete the semester task
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	
<b>9<sup>th</sup> week:</b> <b>Lecture:</b> Polymer II - Certification procedures for industrial polymers, case studies <b>Practice:</b> Microscopic analysis to complete the semester task	<b>10<sup>th</sup> week:</b> <b>Lecture:</b> Ceramics I - Overview <b>Practice:</b> Microscopic analysis to complete the semester task
<b>11<sup>th</sup> week:</b> <b>Lecture:</b> Ceramics II - Production technology <b>Practice:</b> Measurement of toughness and theoretical strength calculation of the ceramic coating of the neural implant.	<b>12<sup>th</sup> week:</b> <b>Lecture:</b> Ceramics III - Qualification procedures <b>Practice:</b> Measurement of toughness and theoretical strength calculation of the ceramic coating of the neural implant.
<b>13<sup>th</sup> week:</b> <b>Lecture:</b> Composite materials. <b>Practice:</b> Presentation of semester task	<b>14<sup>th</sup> week:</b> <b>Lecture:</b> Special and Biocompatible materials. <b>Practice:</b> Microscopic analysis of human implants
<b>15<sup>th</sup> week: 2<sup>nd</sup> drawing week</b>	

## 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 cannot take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late counts as 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 8<sup>th</sup> week and the end-term test is on the 15<sup>th</sup> 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.

## Technique of Measurement

Subject group: Professional Compulsory Subjects – Faculty of Engineering

Model curriculum number: 22

Code: MK3TEMER04HX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade, measurement report

Year, Semester: 2<sup>nd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): Electrotechnics

Further courses are built on it: 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. Histan: 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

#### 1<sup>st</sup> week Registration week

##### 2<sup>nd</sup> 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 regulations. Accident prevention and safety education.

##### 4<sup>th</sup> 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.

##### 3<sup>rd</sup> 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.

##### 5<sup>th</sup> week:

**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

**6<sup>th</sup> 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.

**8<sup>th</sup> week: 1<sup>st</sup> drawing week****9<sup>th</sup> week:**

**Lecture:** A capacitive proximity switch. Its structure, working principle, characteristics and application areas.

**Practical:** Measuring of capacitive proximity switch.

**11<sup>th</sup> 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.

**13<sup>th</sup> week:**

**Lecture:** Description of the main features of the NI LabVIEW software.

**Practical:** National Instruments with hardware and software. Edit VI. Measuring system construction, Troubleshooting practice

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week: End-term test****7<sup>th</sup> week:**

**Lecture:** An optical gate. Its structure, working principle and characteristics, and application areas.

**Practical:** Measurement of an optical gate.

**Mid-term test****10<sup>th</sup> week:**

**Lecture:** Ultrasonic sensors. Their structures, working principles, characteristics, and application areas.

**Practical:** Measuring of an ultrasonic distance sensor.

**12<sup>th</sup> week:**

**Lecture:** The Reed switch and magneto inductive sensors. Their structures, working principles, characteristics and Application areas.

**Practical:** Measuring of reed switch.

**14<sup>th</sup> week:**

**Lecture:** Structure of the NI data acquisition systems. DAQ connecting to your computer. **Practical:** Recording and evaluation of data measured by National Instruments Hardware

**Requirements****A, for a signature:**

Attendance at lectures is recommended, but not compulsory. Participation at practice classes is compulsory. Students must attend the practice classes and may not miss more than three classes during the semester. In case a student does so, the subject will not be signed and the student must repeat the course. A student cannot 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 does not 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)

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

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 34

Code: MK3AGK1R04HX17-EN

ECTS Credit Points: 1

Evaluation: mid-semester grade

Year, Semester: 2<sup>nd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): -

Further courses are built on it: Yes

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

**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 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:

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 Commission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course aims to contribute to the achievement of safe flight during their proposed pilot career. It is crucial for a pilot to be able to recognize hazards during a flight and to apply the right procedures in such cases.

**Literature:**

*Compulsory:*

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

**Schedule**

<b>1<sup>st</sup> week Registration week</b>	
<b>2<sup>nd</sup> week:</b> <b>Lecture and practice:</b> Fuselage, wings and stabilizing surfaces	<b>3<sup>rd</sup> week:</b> <b>Lecture and practice:</b> Landing gear
<b>4<sup>th</sup> week:</b> <b>Lecture and practice:</b> Aircraft wheels, tyres, brakes	<b>5<sup>th</sup> week:</b> <b>Lecture and practice:</b> Basic hydraulics
<b>6<sup>th</sup> week:</b> Piston engines – General, lubrication, cooling <b>Lecture and practice:</b> Piston engines – Icing, fuel injection, performance, propellers	<b>7<sup>th</sup> week:</b> Piston engines – Ignition, fuel, Mixture, carburettors <b>Lecture and practice:</b> DC electrics – Basics, switches, circuit protection, capacitors
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	
<b>9<sup>th</sup> week:</b> DC electrics – Batteries, magnetism, generators, alternators	<b>10<sup>th</sup> week:</b> DC motors, aircraft electrical power systems, screening
<b>11<sup>th</sup> week:</b> Pneumatic system	<b>12<sup>th</sup> week:</b> Pressurization
<b>13<sup>th</sup> week:</b> Oxygen system	<b>14<sup>th</sup> week:</b> Smoke detection, fire detection and protection
<b>15<sup>th</sup> week: 2<sup>nd</sup> drawing week</b>	

## **Requirements**

### **A, for a signature:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

### **B, for grade:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

## **Aircraft General Knowledge – Instrumentation (ATPL)**

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 35

Code: MK3AGKIR04HX17-EN

ECTS Credit Points: 2

Evaluation: authority exam

Year, Semester: 2<sup>nd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): -

Further courses are built on it: 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 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:

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 the complex knowledge of instrumentation used in general and professional aviation by simple, complex and jet airplanes.



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), Instrumentation, 2015, ISBN: 978 1 90620 268 2

**Schedule**

**1<sup>st</sup> week Registration week**

**2<sup>nd</sup> 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

**4<sup>th</sup> week:**

**Lecture:** Magnetism – direct-reading compass and flux valve, Earth’s magnetic field, Aircraft magnetic field, Direct-reading magnetic compass, Flux valve

**Practice:** Magnetism examples

**6<sup>th</sup> 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

**3<sup>rd</sup> 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

**5<sup>th</sup> week:**

**Lecture:** Gyroscopic instruments, Gyroscope: basic principles, Rate-of-turn indicator — Turn coordinator — Balance (slip) indicator, Attitude indicator (artificial horizon), Directional gyroscope, Remote-reading compass systems

**Practice:** Lab demonstration

**7<sup>th</sup> 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

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> 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

**11<sup>th</sup> 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

**13<sup>th</sup> 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 Attitude Director Indicator (EADI), Navigation Display (ND), Electronic Flight Bag (EFB)

**Practice:** Site visit, simulator demonstration

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

**Requirements**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface..

**B, for grade:**

**10<sup>th</sup> 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

**12<sup>th</sup> 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

**14<sup>th</sup> week:**

**Lecture:** Maintenance, Monitoring and recording systems, Cockpit Voice Recorder (CVR), Flight Data Recorders (FDR), Maintenance and monitoring systems, Integrated Health & Usage Monitoring System (IHUMS), Aeroplane Condition Monitoring System (ACMS)

**Practice:** Case studies

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

## Radionavigation (ATPL)

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 36

Code: MK3RANAR04HX17-EN

ECTS Credit Points: 2

Evaluation: authority exam

Year, Semester: 2<sup>nd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): -

Further courses are built on it: No

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

### Topics:

The course teaches the basic knowledge of Radio Navigation 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:

Basic radio propagation theory, radio aids, radar, doppler radar, VDF, NDB 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 background and basis of aviation, learn the structure and sources of the rules.

### Literature:

*Compulsory:*

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

### Schedule

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

**Lecture:** Basic radio propagation theory, Basic principles, Electromagnetic waves,

#### 3<sup>rd</sup> week:

**Lecture:** Radio aids, Ground D/F, Non-Directional Beacon (NDB)/ Automatic

Frequency, wavelength, amplitude, phase angle, Frequency bands, sidebands, Pulse characteristics, Carrier, modulation, Kinds of modulation (amplitude, frequency, pulse, phase)

**Practice:** Instrument demonstration

**4<sup>th</sup> week:**

**Lecture:** Radio aids, VOR and Doppler VOR, DME, Principles, Presentation and interpretation, Coverage and range, Error and accuracy, Factors affecting range and accuracy

**Practice:** VOR/DME demonstration, Flying an approach

**6<sup>th</sup> week:**

**Lecture:** Radar, Pulse techniques and associated terms, Ground radar, Principles

**Practice:** Presentation and interpretation

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Lecture:** GPS, GLONASS, GALILEO (Principles, Operation NAVSTAR GPS, GLONASS, Errors and factors affecting accuracy)

**Practice:** System presentation

**11<sup>th</sup> week:**

**Lecture:** Performance-based navigation (PBN) concept (as described in ICAO Doc 9613) Navigation computer, VOR/DME navigation, PBN principles, components, scope, Navigation specifications, Area navigation (RNAV) and required navigation performance (RNP), Navigation functional

Direction Finder (ADF), Principles, Presentation and interpretation, Coverage and range, Errors and accuracy, Factors affecting range and accuracy

**Practice:** NDB/ADF demonstration, Flying an approach

**5<sup>th</sup> week:**

**Lecture:** Radio aids (ILS, Principles, Presentation and interpretation, Coverage and range, Errors and accuracy, Factors affecting range and accuracy; Microwave Landing System (MLS), Principles, Presentation and interpretation, Coverage and range, Error and accuracy)

**Practice:** ILS demonstration, Flying an approach

**7<sup>th</sup> week:**

**Lecture:** Radar, Airborne weather radar, Principles, Secondary surveillance radar and transponder, Principles, Modes and codes, Errors and accuracy

**Practice:** Presentation and interpretation

**10<sup>th</sup> week:**

**Lecture:** 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

**12<sup>th</sup> week:**

**Lecture:** Use of performance-based navigation (PBN), Performance-based navigation (PBN) operations (Specific RNAV and RNP system functions, Performance-based navigation (PBN) principles, On-board performance monitoring and alerting, Abnormal situations, Database management

requirements, Designation of RNP and RNAV specifications

**Practice:** PBN examples

**13<sup>th</sup> week:**

**Lecture:** Requirements of specific RNAV and RNP specifications, RNAV 10, RNAV 5, RNAV 1/RNAV 2/RNP 1/RNP 2

**Practice:** Site visit, Flying an approach demonstration

**Practice:** Site visit, Flight deck demonstration

**14<sup>th</sup> week:**

**Lecture:** Requirements of specific RNAV and RNP specifications (Required navigation performance approach (RNP APCH), Required navigation performance authorisation required approach (RNP AR APCH), Advanced required navigation performance (A-RNP)

**Practice:** Site visit, Flying an approach demonstration

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

**Requirements**

**A, for a signature:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface

**B, for grade:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

**Communication IFR (ATPL)**

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 37

Code: MK3COMIR01HX20-EN

ECTS Credit Points: 1

Evaluation: authority exam

Year, Semester: 2<sup>nd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): -

Further courses are built on it: No

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

**Topics:**

The course teaches the basic knowledge of Communication 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 (IFR), action required to be taken in case of communication failure, distress and urgency procedures, 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

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

##### Lecture:

IFR COMMUNICATIONS, CONCEPTS

*Associated terms:*

Meanings and significance

Air Traffic Services abbreviations,

**Practice:** practical examples

#### 4<sup>th</sup> week:

##### Lecture:

IFR COMMUNICATIONS, GENERAL OPERATING PROCEDURES

*Transmission standards:*

Transmission of letters

Transmission of numbers

Transmission of time

**Practice:** practical examples

#### 6<sup>th</sup> week:

#### 3<sup>rd</sup> week:

##### Lecture:

IFR COMMUNICATIONS, CONCEPTS

*Associated terms:*

Q-code groups commonly used in radiotelephony (RT) air – ground communications,

Categories of messages

**Practice:** practical examples

#### 5<sup>th</sup> week:

##### Lecture:

IFR COMMUNICATIONS, GENERAL OPERATING PROCEDURES

*Transmission standards:*

Transmission techniques

Standard words and phrases (relevant RTF phraseology included)

**Practice:** practical examples

#### 7<sup>th</sup> week:

**Lecture:**

IFR COMMUNICATIONS, GENERAL OPERATING PROCEDURES

*Transmission standards:*

RT call signs for aeronautical stations including use of abbreviated call signs

**Practice:** practical examples

**Lecture:**

IFR COMMUNICATIONS, GENERAL OPERATING PROCEDURES

*Transmission standards:*

RT call signs for aircraft including use of abbreviated call signs

Transfer of communication

Test procedures including readability scale

**Practice:** practical examples

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Lecture:**

IFR COMMUNICATIONS, GENERAL OPERATING PROCEDURES

*Transmission standards:*

Read-back and acknowledgement requirements

Radar procedural phraseology

Level changes and reports

Data link messages

**Practice:** practical examples

**10<sup>th</sup> week:**

**Lecture:**

IFR COMMUNICATIONS, RELEVANT WEATHER INFORMATION

*Aerodrome weather:*

Aerodrome weather terms,

Weather broadcast

**Practice:** practical examples

**11<sup>th</sup> week:**

**Lecture:**

IFR COMMUNICATIONS, VOICE COMMUNICATION FAILURE

*Required action:*

Action required to be taken in case of communication failure

**Practice:** practical examples

**12<sup>th</sup> week:**

**Lecture:**

IFR COMMUNICATIONS, DISTRESS AND URGENCY PROCEDURES

*Signals and procedures:*

Distress

Urgency

**Practice:** practical examples

**13<sup>th</sup> week:**

**Lecture:**

IFR COMMUNICATIONS, VHF PROPAGATION AND ALLOCATION OF FREQUENCIES

*General Principles:*

Spectrum, bands, range

**Practice:** practical examples

**14<sup>th</sup> week:**

**Lecture:**

IFR COMMUNICATIONS, OTHER COMMUNICATIONS

*Weather observations, Morse code:*

Meteorological observations,

Use of Morse code

**Practice:** practical examples

## 15<sup>th</sup> week: 2<sup>nd</sup> drawing week

### Requirements

#### **A, for a signature:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

#### **B, for grade:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.



## Microeconomics and Economical Processes of Enterprises

Subject group: Economics and Humanities – Faculty of Engineering

Model curriculum number: 11

Code: MK3MIKVM04XX17-EN

ECTS Credit Points: 3

Evaluation: exam

Year, Semester: 3<sup>rd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): Economics for Engineers

Further courses are built on it: 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 – Breutigam, Ronald R. (2014): Microeconomics. Fifth Edition (International Student version). John Wiley and Sons, Inc., New York. ISBN: 978-1-118-71638-0
- Besanko, David – Breutigam, 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 Cengage Learning.
- 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**

**1<sup>st</sup> week Registration week**

**2<sup>nd</sup> 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.

**4<sup>th</sup> 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.

**6<sup>th</sup> week:**

**Lecture:** Production. Inputs and production function. Total product function. Marginal product of labour and average product of labour.

**3<sup>rd</sup> 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

**5<sup>th</sup> 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.

**7<sup>th</sup> 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,

**Practice:** Calculation/team problems: Average product of labour (capital), marginal product of labour (capital), relationship between marginal product and average product.

#### 8<sup>th</sup> week: 1<sup>st</sup> drawing week

##### 9<sup>th</sup> 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

##### 11<sup>th</sup> 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.

##### 13<sup>th</sup> week:

**Lecture:** Main characteristics of oligopoly and monopolistic competition. Markets with a few sellers, product differentiation.

**Practice:** Calculation/team problems: Oligopoly market behaviour.

#### 15<sup>th</sup> week: 2<sup>nd</sup> drawing week

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.

##### 10<sup>th</sup> 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.

##### 12<sup>th</sup> 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.

##### 14<sup>th</sup> 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.

## 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 cannot take part in any practice class with another group. Attendance at practice classes will be recorded by the practice leader. Being late counts as 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 7<sup>th</sup> week and the end-term test on the 15<sup>th</sup> 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:

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

Subject group: Economics and Humanities – Faculty of Engineering

Model curriculum number: 12

Code: MK3MINMM04XX17-EN

ECTS Credit Points: 3

Evaluation: exam

Year, Semester: 3<sup>rd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): -

Further courses are built on it: 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 an 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

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

## 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 counts as 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 cannot 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**

Subject group: Economics and Humanities – Faculty of Engineering

Model curriculum number: 13

Code: MK3EPDGK04RX17-EN

ECTS Credit Points: 2

Evaluation: mid-semester grade

Year, Semester: 3<sup>rd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): -

Further courses are built on it: 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

1 <sup>st</sup> week Registration week	
<p><b>2<sup>nd</sup> week:</b> Basics of Environmental Protection and Environmental Management</p> <p><b>Practice:</b> Introduction to environmental protection; Global issues on environmental protection, the environmental issues of air transport</p> <p><b>4<sup>th</sup> week: Water and Soil Protection</b></p> <p><b>Practice:</b>Water protection and quality, pollutants Protection of soil quality</p> <p><b>6<sup>th</sup> week:</b> The environmental issues of air transport</p> <p><b>Practice:</b> Environmental policies of International Civil Aviation Organization (ICAO).</p>	<p><b>3<sup>rd</sup> week:</b> Air Quality and Air Quality Control</p> <p><b>Practice:</b> Basics of air pollution control, processes in the atmosphere, greenhouse gases, ozone layer, smog, acid rain</p> <p><b>5<sup>th</sup> week:</b> Environmental Noise, Waste Management</p> <p><b>Practice:</b> The basics of environmental noise, measuring devices and techniques Waste management, possibilities, disposal, techniques and hazardous waste</p> <p><b>7<sup>th</sup> week:</b> The environmental issues of air transport</p> <p><b>Practice:</b> Environmental policies of International Air Transport Association (IATA)</p>
<p><b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b></p>	

**9<sup>th</sup> week:** Air transport safety and security

**Practice:** Main goals of air transport safety and security

**11<sup>th</sup> week:** Transportation of dangerous goods

**Practice:** DG shipment features and documentation

**13<sup>th</sup> week:** Transportation of dangerous goods

**Practice:** IATA Dangerous Goods Regulations (DGR)

**10<sup>th</sup> week:** Transportation of dangerous goods

**Practice:** Transportation of dangerous goods (basics of dangerous goods, hazard and handling labels, etc.)

**12<sup>th</sup> week:** Transportation of dangerous goods

**Practice:** ICAO Dangerous Panel

**14<sup>th</sup> week:** Mid-semester TEST

**15<sup>th</sup> week:** 2<sup>nd</sup> 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 has to be at least 50%.

## Manufacturing Technologies

Subject group: Professional Compulsory Subjects – Faculty of Engineering

Model curriculum number: 23

Code: MK3GYARG04RX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 3rd year, 1st semester

Its prerequisite(s): Aircraft Technology

Further courses are built on it: 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,



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)

#### 4th week:

**Lecture:** The process and tools of turning technologies

**Practice:** Designing of turning technology

#### 6th week:

**Lecture:** The process and tools of milling technologies

**Practice:** Designing of milling technologies

#### 3rd week:

**Lecture:** Process of chip formation, tool wear and tool life

**Practice:** Calculation tasks for tool wear and tool life

#### 5th week:

**Lecture:** The process and tools of drilling and counterbore technologies

**Practice:** Designing of drilling and counterbore 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.

### 11th week:

**Lecture:** Classification of manufacturing processes (casting, forming, material removal, joining). Advantages of casting. Casting terminology. Sand casting.

**Practice:** Planning and finite element simulation of cold rolling technology (SolidWorks and Simufact Forming).

### 13th week:

**Lecture:** Classification of forging operations. Types of forging dies. Overview of metal forming of sheet metals. Bending and deep drawing.

**Practice:** Planning and finite element simulation of die forging technology (SolidWorks and Simufact Forming).

### 10th week:

**Lecture:** Properties of materials. Industrial materials. The uniaxial tensile test. Upsetting test.

**Practice:** Basic studies of Computer Aided Manufacturing (CAM). The types of manufacturing systems

### 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).

### 14th week:

**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).

## 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.

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

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 38

Code: MK3AGK2R04HX17-EN

ECTS Credit Points: 3

Evaluation: authority exam

Year, Semester: 3<sup>rd</sup> year, 1<sup>st</sup> semester

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

Further courses are built on it: No

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

### **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 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:

Anti and de-icing systems, fuel system, smoke and fire protection and detection systems, AC electrics, switches, generators and alternators, aircraft electric power system, 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 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), Airframes and Systems, 2015, ISBN: 978 1 90620 265 1
- CAE OXFORD AVIATION ACADEMY (UK), Electrics and electronics, 2015, ISBN: 978 1 90620 266 8
- CAE OXFORD AVIATION ACADEMY (UK), Powerplant, 2015, ISBN: 978 1 90620 267 5

## Schedule

<b>1<sup>st</sup> week Registration week</b>	
<b>2<sup>nd</sup> week:</b> <b>Lecture and practice:</b> Flight control systems	<b>3<sup>rd</sup> week:</b> <b>Lecture and practice:</b> Flight controls
<b>4<sup>th</sup> week:</b> <b>Lecture and practice:</b> Powered flying controls	<b>5<sup>th</sup> week:</b> <b>Lecture and practice:</b> Ice and rain protection
<b>6<sup>th</sup> week:</b> <b>Lecture and practice:</b> Fuel systems	<b>7<sup>th</sup> week:</b> <b>Lecture and practice:</b> AC electrics – Basics, alternators
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	
<b>9<sup>th</sup> week:</b> <b>Lecture and practice:</b> AC electrics – Aircraft systems, transformers	<b>10<sup>th</sup> week:</b> <b>Lecture and practice:</b> AC electrics – AC motors, semiconductors, logic gates
<b>11<sup>th</sup> week:</b> <b>Lecture and practice:</b> Gas turbines – Basic principles	<b>12<sup>th</sup> week:</b> <b>Lecture and practice:</b> Gas turbines – Main engine components
<b>13<sup>th</sup> week:</b> <b>Lecture and practice:</b> Gas turbines – Additional components and systems	<b>14<sup>th</sup> week:</b> <b>Lecture and practice:</b> Gas turbines – Engine operation and monitoring
<b>15<sup>th</sup> week: 2<sup>nd</sup> drawing week</b>	

## Requirements

### A, for a signature:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

### B, for grade:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface

## **Air Law (ATPL)**

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 39

Code: MK3AIRLR04HX17-EN

ECTS Credit Points: 2

Evaluation: authority exam

Year, Semester: 3<sup>rd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): -

Further courses are built on it: No

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

### **Topics:**

The course teaches the comprehensive knowledge of Air Law 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: 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 background and basis of aviation, learn the structure and sources of the rules.

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

The course aims to contribute to the achievement of safe flight during their proposed pilot career. It is crucial for a pilot to be able to recognize hazards during a flight and to apply the right procedures in such cases.

### **Literature:**

*Compulsory:*

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

## Schedule

<b>1<sup>st</sup> week Registration week</b>	
<b>2<sup>nd</sup> week:</b> <b>Lecture and practice:</b> International Law: conventions, agreements and organisations	<b>3<sup>rd</sup> week:</b> <b>Lecture and practice:</b> Airworthiness of aircraft, aircraft nationality and registration marks
<b>4<sup>th</sup> week:</b> <b>Lecture and practice:</b> Personnel licencing	<b>5<sup>th</sup> week:</b> <b>Lecture and practice:</b> Rules of the air
<b>6<sup>th</sup> week:</b> <b>Lecture and practice:</b> Procedures for air navigation services – aircraft operations	<b>7<sup>th</sup> week:</b> <b>Lecture and practice:</b> Air traffic services and air traffic management – ICAO Annex 11 – Air traffic services
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	
<b>9<sup>th</sup> week:</b> <b>Lecture and practice:</b> Air traffic services and air traffic management – ICAO Doc 4444 – Air Traffic Management	<b>10<sup>th</sup> week:</b> <b>Lecture and practice:</b> Aeronautical Information service
<b>11<sup>th</sup> week:</b> <b>Lecture and practice:</b> Aerodromes – General, physical characteristics, aerodrome design	<b>12<sup>th</sup> week:</b> <b>Lecture and practice:</b> Aerodromes – Visual aids for navigation, aerodrome operations
<b>13<sup>th</sup> week:</b> <b>Lecture and practice:</b> Aerodromes – facilitation	<b>14<sup>th</sup> week:</b> <b>Lecture and practice:</b> Aerodromes –Search and rescue, Security
<b>15<sup>th</sup> week: 2<sup>nd</sup> drawing week</b>	

## Requirements

### A, for a signature:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

### B, for grade:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

## Flight Planning and Monitoring (ATPL)

Subject group: Field-Specific Vocational Subjects – ATP(A)

Model curriculum number: 46

Code: MK3FLPMR03HX17-EN

ECTS Credit Points: 3

Evaluation: authority exam

Year, Semester: 3<sup>rd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): -

Further courses are built on it: 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 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:

Air information publications, topographical chart, weather charts flight 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 background and basis of aviation, learn the structure and sources of the rules.

### Literature:

*Compulsory:*

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

### Schedule

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> 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

#### 3<sup>rd</sup> 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

**4<sup>th</sup> 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

**6<sup>th</sup> 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

**8<sup>th</sup> week: 1<sup>st</sup> drawing week****9<sup>th</sup> week:**

**Lecture:** Pre-flight preparation, NOTAM briefing, Ground facilities and services, Departure, destination and alternate aerodromes, Airway routings and airspace structure

**Practice:** NOTAM examples, case studies

**11<sup>th</sup> 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

**13<sup>th</sup> week:**

**Lecture:** Flight monitoring and in-flight replanning, Flight monitoring, Monitoring

**5<sup>th</sup> week:****Lecture:**

Flight planning for IFR flights, IFR navigation plan, Instrument-approach charts, Communications and radio-navigation planning data

**Practice:** Completion of navigation plan IFR flights

**7<sup>th</sup> 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

**10<sup>th</sup> week:**

**Lecture:** Pre-flight preparation, Meteorological briefing, Extraction and analysis of relevant data from meteorological documents, Extraction and 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

**12<sup>th</sup> 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

**14<sup>th</sup> week:**

**Lecture:** Flight monitoring and in-flight replanning II, Flight monitoring, In-flight



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

replanning in case of deviation from planned data

**Practice:** Case studies

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

## Requirements

### **A, for a signature:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

### **B, for grade:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface

## **Environment, Health, Safety and Ergonomics (Basics of EHS)**

Subject group: Professional Compulsory Subjects – Faculty of Engineering

Model curriculum number: 24

Code: MK3EHSK04RX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 3<sup>rd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): -

Further courses are built on it: No

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

### **Topics:**

The subject covers three main topics:

Environment (E): The most important topics related to environmental protection are introduced to students. The subject includes air quality, noise protection, water protection, soil protection, and waste management side topics.

Health (H): The basic concepts 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

<b>1<sup>st</sup> week Registration week</b>	
<p><b>2<sup>nd</sup> week: Basics of Environmental Protection and Environmental Management</b></p> <p><b>Lecture:</b> Introduction to environmental protection</p> <p><b>Practice:</b> Global issues on environmental protection</p>	<p><b>3<sup>rd</sup> week: Air Quality Control</b></p> <p><b>Lecture:</b> Basics of air pollution control, processes in the atmosphere, greenhouse gases, ozone layer, smog, acid rain</p> <p><b>Practice:</b> Exercises in connection with air pollution</p>
<p><b>4<sup>th</sup> week: Environmental Noise</b></p> <p><b>Lecture:</b> The basics of environmental noise</p> <p><b>Practice:</b> Noise measuring devices and techniques</p>	<p><b>5<sup>th</sup> week: Water Protection</b></p> <p><b>Lecture:</b> Water protection and quality, pollutants</p> <p><b>Practice:</b> Practice in connection with water protection (plant visit: wastewater treatment plant)</p>
<p><b>6<sup>th</sup> week: Soil Protection</b></p> <p><b>Lecture:</b> Protection of soil quality</p> <p><b>Practice:</b> Practice in connection with soil protection</p>	<p><b>7<sup>th</sup> week: Waste Management</b></p> <p><b>Lecture:</b> Waste management, possibilities, disposal, techniques and hazardous waste</p> <p><b>Practice:</b> Practice in connection with waste management (plant visit)</p>
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	
<p><b>9<sup>th</sup> week: Basics of labor safety and fire protection</b></p> <p><b>Lecture:</b> Personal, material and organizational requirements for safe work, ergonomic fundamentals</p> <p><b>Practice:</b> Practice in connection with labor safety I. (plant visit)</p>	<p><b>10<sup>th</sup> week: Occupational Safety</b></p> <p><b>Lecture:</b> Personal protective equipment, work safety reviews, employer checks, workplace risk assessment</p> <p><b>Practice:</b> Practice in connection with labor safety II. (plant visit)</p>
<p><b>11<sup>th</sup> week: Labor and Health</b></p> <p><b>Lecture:</b> The impact of work on health and the health impact on working ability</p> <p><b>Practice:</b> Practice in connection with occupational health I.</p>	<p><b>12<sup>th</sup> week: Occupational Health and Work Hygiene</b></p> <p><b>Lecture:</b> Fundamentals of occupational health and work hygiene</p> <p><b>Practice:</b> Practice in connection with occupational health II.</p>
<p><b>13<sup>th</sup> week: Industrial Safety and Security</b></p> <p><b>Lecture:</b> Main goals of industrial safety and security</p> <p><b>Practice:</b> Practice in connection with industrial safety and security</p>	<p><b>14<sup>th</sup> week: Mid-semester TEST</b></p>

## 15<sup>th</sup> week: 2<sup>nd</sup> 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 has to be at least 50%.

### Human Performance (ATPL)

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 40

Code: MK3HUMPR03HX17-EN

ECTS Credit Points: 2

Evaluation: authority exam

Year, Semester: 3<sup>rd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): -

Further courses are built on it: No

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

#### Topics:

The course teaches the basic knowledge of Human Performance 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:

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 Commission are used when developing the Part-FCL theoretical knowledge elements of the course.

The course aims 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: 978 1 90620 271 2

**Schedule**

<b>1<sup>st</sup> week Registration week</b>	
<p><b>2<sup>nd</sup> week:</b>  <b>Lecture:</b> Human factors – basic concepts, Human factors in aviation, Becoming a competent pilot  <b>Practice:</b> Factors in training that ensures the future competency of the individual pilot</p> <p><b>4<sup>th</sup> week:</b>  <b>Lecture:</b> Basics of flight psychology, The atmosphere, Respiratory and circulatory system, High-altitude environment  <b>Practice:</b> Site visit, demonstration of measurements for Respiratory and circulatory system</p> <p><b>6<sup>th</sup> week:</b>  <b>Lecture:</b> Health and hygiene, Personal hygiene, Body rhythm and sleep, Problem areas for pilots, Common minor ailments, Intoxication, Incapacitation in flight  <b>Practice:</b> Case studies of sleep problems and incapacitation</p>	<p><b>3<sup>rd</sup> week:</b>  <b>Lecture:</b> Safety, Accident statistics, Flight safety concepts, Safety culture  <b>Practice:</b> Accident investigation studies</p> <p><b>5<sup>th</sup> week:</b>  <b>Lecture:</b> Man and environment, the sensory system, Central, peripheral and autonomic nervous systems, Vision, Hearing, Equilibrium, Integration of sensory inputs  <b>Practice:</b> Site visit, demonstration of measurements for Central, peripheral and autonomic nervous systems, Vision, Hearing</p> <p><b>7<sup>th</sup> week:</b>  <b>Lecture:</b> Basic aviation psychology, information processing, Attention and vigilance, Perception, Memory, Response selection Learning principles and techniques, Motivation  <b>Practice:</b> Site visit, demonstration of measurements for Attention and vigilance, Perception, Memory, Response selection</p>
<b>8<sup>th</sup> week: 1<sup>st</sup> drawing week</b>	
<p><b>9<sup>th</sup> week:</b>  <b>Lecture:</b> Human error and reliability, Reliability of human behaviour, Mental models and situation awareness, Theory</p>	<p><b>10<sup>th</sup> week:</b>  <b>Lecture:</b> Decision-making, Decision-making concepts, nature of bias and its influence on the decision-making process,</p>

and model of human error, Error generation

**Practice:** Case studies

**11<sup>th</sup> week:**

**Lecture:** Avoiding and managing errors, cockpit management, Safety awareness, Coordination (multi-crew concepts), Cooperation, Communication

**Practice:** Site visit, coordination examples

**13<sup>th</sup> week:**

**Lecture:** Human overload and underload, Arousal, Stress, Fatigue and stress management

**Practice:** Measurement techniques of fatigue

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

**12<sup>th</sup> week:**

**Lecture:** Human behavior, Personality, attitude and behaviour, Individual differences in personality and motivation, Identification of hazardous attitudes (error proneness)

**Practice:** Team work, presentation

**14<sup>th</sup> week:**

**Lecture:** Advanced cockpit automation, advantages and disadvantages, Automation complacency, Working concepts

**Practice:** Site visit, demonstration of automation

**15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

**Requirements**

**A, for a signature:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

**B, for grade:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

**Mass and Balance (ATPL)**

Subject group: Field-Specific Vocational Subjects – ATP(A)

Model curriculum number: 47

Code: MK3MASSR03HX17-EN

ECTS Credit Points: 2

Evaluation: authority exam

Year, Semester: 3<sup>rd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): -

Further courses are built on it: 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 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:

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-engine 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 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: 978 1 90620 269 9

### Schedule

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> 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

#### 4<sup>th</sup> week:

**Lecture:** Loading, Mass calculations, Maximum masses for take-off and landing,

#### 3<sup>rd</sup> week:

**Lecture:** Loading, Terminology, Mass terms, Load terms (including fuel terms), Mass limits, Structural limitations, Performance limitations,-compartment limitations

**Practice:** Documentation examples

#### 5<sup>th</sup> week:

**Lecture:** Fundamentals of centre-of-gravity calculations, Definition of Centre of Gravity

traffic load and fuel load, Use of standard masses for passengers, baggage and crew

**Practice:** Mass calculation examples

**6<sup>th</sup> 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

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> 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

**11<sup>th</sup> week:**

**Lecture:** Determination of CG position, Load and trim sheet, General considerations

**Practice:** Load and trim sheet examples, case studies

**13<sup>th</sup> 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

(CG), Conditions of equilibrium (balance of forces and balance of moments)

**Practice:** Basic calculations of CG

**7<sup>th</sup> 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

**10<sup>th</sup> week:**

**Lecture:** Determination of CG position, Methods, Arithmetic method, Graphic method, Index method

**Practice:** Methods examples

**12<sup>th</sup> week:**

**Lecture:** Determination of CG position, Load sheet and CG envelope for light aeroplanes and for helicopters

**Practice:** Load and trim sheet examples, case studies

**14<sup>th</sup> week:**

**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



## 15<sup>th</sup> week: 2<sup>nd</sup> drawing week

### Requirements

#### A, for a signature:

Refer to the effective version of “Training Guidance for Professional Pilot BSc (Integrated ATP(A) Course) Students”. The guidance is available on the university website and the ATO online administrative interface.

#### B, for grade:

Refer to the effective version of “Training Guidance for Professional Pilot BSc (Integrated ATP(A) Course) Students”. The guidance is available on the university website and the ATO online administrative interface.

### Performance (ATPL)

Subject group: Field-Specific Vocational Subjects – ATP(A)

Model curriculum number: 48

Code: MK3PERFR04HX17-EN

ECTS Credit Points: 3

Evaluation: authority exam

Year, Semester: 3<sup>rd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): -

Further courses are built on it: 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 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:

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: 978 1 90620 269 9

## Schedule

### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

**Lecture:** General information, 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

#### 4<sup>th</sup> 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

#### 6<sup>th</sup> week:

**Lecture:** Performance class B multi-engine aeroplanes, Use of aeroplane performance data, Take-off, Climb, Cruise and descent, Landing

**Practice:** Performance data examples

### 8<sup>th</sup> week: 1<sup>st</sup> drawing week

#### 9<sup>th</sup> 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

#### 11<sup>th</sup> week:

**Lecture:** Performance class A, Cruise, Cruise techniques, Maximum endurance,

#### 3<sup>rd</sup> 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

#### 5<sup>th</sup> week:

**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

#### 7<sup>th</sup> 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

#### 10<sup>th</sup> week:

**Lecture:** Performance class A, Climb, Climb techniques, Influence of variables on climb performance, Use of aeroplane flight data

**Practice:** Climb examples

#### 12<sup>th</sup> week:

**Lecture:** Performance class A, En route one engine inoperative, Drift down, Influence of

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

#### **13<sup>th</sup> week:**

**Lecture:** Performance class A, Descent, Descent techniques, Influence of variables on descent performance, Use of aeroplane flight data

**Practice:** Descent techniques examples

variables on the en route one engine inoperative performance

**Practice:** Determination of en route flight path data, speed during drift down

#### **14<sup>th</sup> 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

### **15<sup>th</sup> week: 2<sup>nd</sup> drawing week**

#### **Requirements**

##### **A, for a signature:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

##### **B, for grade:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

#### **Operational Procedures (ATPL)**

Subject group: Field-Specific Vocational Subjects – ATP(A)

Model curriculum number: 49

Code: MK3OPRR02HX17-EN

ECTS Credit Points: 2

Evaluation: authority exam

Year, Semester: 3<sup>rd</sup> year, 2<sup>nd</sup> 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 Operational Procedures 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:

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 background and basis of aviation, learn the structure and sources of the rules.

**Literature:**

*Compulsory:*

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

**Schedule**

1 <sup>st</sup> week Registration week	
<b>2<sup>nd</sup> week:</b> <b>Lecture:</b> General requirements, ICAO Annex 6, Definitions, General, Operational requirements, Operator certification and supervision <b>Practice:</b> Certification and supervision procedures	<b>3<sup>rd</sup> week:</b> <b>Lecture:</b> 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 <b>Practice:</b> Low-visibility operations, VFR operating minima, RVR
<b>4<sup>th</sup> week:</b> <b>Lecture:</b> General requirements, Manuals, logs and records, Flight and duty-time limitations	<b>5<sup>th</sup> week:</b> <b>Lecture:</b> General requirements, Long-range flights, Flight management, Transoceanic and polar flight, MNPS airspace, ETOPS

and rest requirements, Transport of dangerous goods by air

**Practice:** Flight and duty-time calculation, rostering examples

**6<sup>th</sup> week:**

**Lecture:** Special operational procedures and hazards (general aspects), Operations Manual, Operating procedures, Aeroplane/helicopter operating matters – type-related

**Practice:** Operation manual presentation

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Lecture:** Special operational procedures and hazards, Bird-strike risk and avoidance, Noise abatement, Influence of the flight procedure (departure, cruise, approach), Influence by the pilot (power setting, low drag)

**Practice:** Noise-abatement procedures

**11<sup>th</sup> 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 turbulence case studies

**13<sup>th</sup> 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

**Practice:** Selection of cruising altitude, alternate aerodrome, Polar navigation

**7<sup>th</sup> 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

**10<sup>th</sup> week:**

**Lecture:** Special operational procedures and hazards, Fire and smoke, Carburettor fire, Engine fire, Fire in 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

**12<sup>th</sup> week:**

**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

**14<sup>th</sup> week:**

**Lecture:** Special operations, Additional requirements for commercial specialised operations and CAT operations (Part-ORO)

dangerous goods by air; Contaminated runways, Estimated surface friction, friction coefficient, Hydroplaning principles and effects, Procedures, SNOWTAM

**Practice:** Dangerous goods loading examples; Friction tester in operation, SNOWTAM examples

Flight crew recurrent training and checking, operator proficiency checks, General requirements (Part-SPO), Specialist's responsibilities

**Practice:** none

15<sup>th</sup> week: 2<sup>nd</sup> drawing week

## Requirements

### A, for a signature:

For the general rules for ATO courses, refer to the effective version of "Training Guidance for Professional Pilot BSc Students". The guidance is available on the university website and the ATO online administrative interface.

### B, for grade:

For the general rules for ATO courses, refer to the effective version of "Training Guidance for Professional Pilot BSc Students". The guidance is available on the university website and the ATO online administrative interface.

## Type Rating Course

Subject group: Moduls

Model curriculum number: 51

Code: MK3CREWR04HX17-EN

ECTS Credit Points: 5

Evaluation: mid-semester grade

Year, Semester: 4<sup>th</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): Flight Training IV, Internship III

Further courses are built on it: No

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

### Topics:

The objective of the course is to give high quality type rating training for the applicant to operate the Airbus A320 airplane safely under VFR and IFR operations, to understand and operate all systems, to follow SOP in normal, abnormal and emergency situations.

The course is performed on the A320, the basic variant of the entire A320 CEO family (A318 /A319 /A320 /A321). The course consists Upset Recovery Training (UPRT) and Performance-Based Navigation Training (PBN).

### Literature:

*Compulsory:*

- AIRBUS A320 CBT
- Airbus A320 Flight Crew Operating Manual (FCOM)
- Airbus A320 Flight Crew Training Manual (FCTM)
- Airbus A320 Quick Reference Handbook (QRH)
- Airbus A320 Master Minimum Equipment List (MMEL)

### Schedule

#### 1<sup>st</sup> week Registration week

#### 2<sup>nd</sup> week:

#### Lecture and Practice:

FCOM/FCTM/MMEL/SOP introduction

#### 3<sup>rd</sup> week:

**Lecture and Practice:** Aircraft general, Air conditioning system, Cabin pressurizationsystem, Ventillation system,

**4<sup>th</sup> week:**

**Lecture and Practice:** Flight augmentation, ACARS interface, Print interface, Communication, Electrical system, Equipment

**6<sup>th</sup> week:**

**Lecture and Practice:** Hydraulic, Ice and rain protection system, Electronic instrument system, ECAM – E/WD and SD, Primary flight display, Navigation display, EFIS controls

**8<sup>th</sup> week: 1<sup>st</sup> drawing week**

**9<sup>th</sup> week:**

**Lecture and Practice:** Oxygen system, Pneumatic system description and controls, Water and waste, Maintenance system, Information system

**11<sup>th</sup> week:**

**Lecture and Practice:** PBN training (PBN principles, components, scope Specific RNAV and RNP system functions, On-board performance monitoring and alerting, Abnormal situations, database management, Navigation system functional requirements, Designation of RNAV and RNP specifications, GNSS accuracy and augmentation, Ground-based augmentation system (GBAS), Satellite-based augmentation system (SBAS), Aircraft-based augmentation system (ABAS), Applied procedures on type)

**13th week:**

**Lecture and Practice:** Mass&Balance, Performance Training (Take-off performance calculation, Landing Performance Calculation, In-flight Performance, Loadsheet exercise)

Auto flight – general, Flight management, Flight guidance

**5<sup>th</sup> week:**

**Lecture and Practice:** Fire protection, Flight controls, Fuel system description, Fuel system controls

**7<sup>th</sup> week:**

**Lecture and Practice:** Landing gear, Lights, Navigation

**10<sup>th</sup> week:**

**Lecture and Practice:** Auxiliary power unit, Doors, Cockpit windows, Engines

**12th week:**

**Lecture and Practice:** CRM training (Human factors in aviation, General instruction on CRM principles and objectives, Human performance and limitation, Threat and error management, Personality awareness, human error and reliability, attitudes and behaviours, self-assessment and self-critique, Stress and stress management, Fatigue and vigilance, Assertiveness, situational awareness, information acquisition and processing, Workload management and effective communication, Leadership, cooperation, synergy, delegation, decision making)

**14th week:**

**Lecture and Practice:** UPRT Training (Strategies to develop resilience and mitigate startle effect, Type related procedures and techniques for upset recovery, Nose-high recovery strategy,



## 15<sup>th</sup> week: 2<sup>nd</sup> drawing week

### Requirements

#### A, for a signature:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

#### B, for grade:

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

### APS MCC and JOC

Subject group: Moduls

Model curriculum number: 50

Code:

ECTS Credit Points: 5

Evaluation: mid-semester grade

Year, Semester: 4th year, 1st semester

Its prerequisite(s): Flight Training IV

Further courses are built on it: No

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

### Topics:

The APS MCC training course includes advanced swept-wing jet aeroplane training and airline operations scenario training to equip a pilot with the knowledge, skills, and attitudes required to commence initial type rating training to the standards generally required by a commercial air transport (CAT) operator certified pursuant to Regulation (EU) No 965/2012 (the ‘Air OPS Regulation’).

### Literature:

#### *Compulsory:*

AIRBUS A320 CBT

Airbus A320 Flight Crew Operating Manual (FCOM)

Airbus A320 Flight Crew Training Manual (FCTM)

Airbus A320 Quick Reference Handbook (QRH)

## Airbus A320 Master Minimum Equipment List (MMEL)

### Schedule

#### 1st week Registration week

##### 2nd week:

**Lecture and Practice:** Definitions and terms (MCC definitions, single-pilot and multi-pilot differences, airmanship), Core competencies (technical and non-technical skills)

##### 4th week:

**Lecture and Practice:** Communication (Basics (sender, receiver, message, channel, noise etc.), Verbal, non-verbal, image), decision making (Process and biases, Decision making models (FORDEC, DODAR), Time factor, NITS briefing), Golden Rules of Aviation (Fly, navigate, communicate, Use of automation)

##### 6th week:

**Lecture and Practice:** Standard Operating Procedures (Limitations, Normal procedures, Abnormal and emergency procedures)

#### 8th week: 1st drawing week

##### 9th week:

**Lecture and Practice:** Type related technical knowledge instruction (Flight augmentation, ACARS interface, Print interface, Communication, Electrical system, Equipment)

##### 11th week:

**Lecture and Practice:** Type related technical knowledge instruction

##### 3rd week:

**Lecture and Practice:** SHELL model, CRM (General instruction on CRM principles and objectives, Threat and error management, Personality awareness, human error and reliability, attitudes and behaviours, self-assessment and self-critique, Fatigue and vigilance, Areas of responsibility (PF/PM responsibilities, common areas, task sharing)

##### 5th week:

**Lecture and Practice:** Documentation of a commercial jet (FCOM, FCTM, QRH, MEL, OM), Checklists (Introduction, History, Concepts, Methods, Items, Standardisation), Briefing (Background, data, structure, techniques), Callouts (PF/PM roles, Transfer of control, standard basic callouts, type-related callouts)

##### 7th week:

**Lecture and Practice:** Type related technical knowledge instruction (Aircraft general, Air conditioning system, Cabin pressurizationsystem, Ventillation system, Auto flight – general, Flight management, Flight guidance)

##### 10th week:

**Lecture and Practice:** Type related technical knowledge instruction (Fire protection, Flight controls, Fuel system description, Fuel system controls)

##### 12th week:

(Hydraulic, Ice and rain protection system, Electronic instrument system, ECAM – E/WD and SD, Primary flight display, Navigation display, EFIS controls)

**13th week:**

**Lecture and Practice:** Type related technical knowledge instruction (Oxygen system, Pneumatic system description and controls, Water and waste, Maintenance system, Information system)

**Lecture and Practice:** Type related technical knowledge instruction (Landing gear, Lights, Navigation)

**14th week:**

**Lecture and Practice:** Type related technical knowledge instruction (Auxiliary power unit, Doors, Cockpit windows, Engines)

**15th week: 2nd drawing week**

**Requirements**

**A, for a signature:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

**B, for grade:**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

Flight Training

**Flight Training I**

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 41

Code: MK3FLT1R02HX17-EN

ECTS Credit Points: 4

Evaluation: mid-semester grade

Year, Semester: 2nd year, 1st semester

Its prerequisite(s): Internship I

Further courses are built on it: Yes

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

**Flight Training II**

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 42

Code: MK3FLT2R02HX17-EN

ECTS Credit Points: 7

Evaluation: mid-semester grade

Year, Semester: 2<sup>nd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): Internship I

Further courses are built on it: Yes

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

### **Flight Training III**

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 43

Code: MK3FLT3R02HX17-EN

ECTS Credit Points: 6

Evaluation: mid-semester grade

Year, Semester: 3<sup>rd</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): Internship II

Further courses are built on it: Yes

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

### **Flight Training IV**

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 44

Code: MK3FLT4R02HX17-EN

ECTS Credit Points: 6

Evaluation: mid-semester grade

Year, Semester: 3<sup>rd</sup> year, 2<sup>nd</sup> semester

Its prerequisite(s): Internship II

Further courses are built on it: Yes

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

## **Flight Training V**

Subject group: Professional Compulsory Subjects – ATP(A)

Model curriculum number: 45

Code: MK3FLT4R02HX17-EN

ECTS Credit Points: 12

Evaluation: mid-semester grade

Year, Semester: 4<sup>th</sup> year, 1<sup>st</sup> semester

Its prerequisite(s): Flight Training III

Further courses are built on it: No

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

### **Topics and Scedule**

For the general rules for ATO courses, refer to the effective version of “Training Guidance for Professional Pilot BSc Students”. The guidance is available on the university website and the ATO online administrative interface.

## DIPLOMA

Within 30 days of the receipt of the certificate on the successful final exam and the language exam in English the diploma is issued and given out by the Faculty at the graduand's special request. Otherwise, the diploma will be awarded to him/her at the graduation ceremony of the Faculty.

Award requirements: Language exam in English (level: B2, type: complex) or GCSE exam or a certificate of the same level and type and **ICAO Level 4 language exam**, a good command of Professional English according to Commission Regulation (EU) No. 1178/2011 (03/11/2011) which lays down the conditions on professional pilot training. However, if the language of the program is not Hungarian, no language examination is required for the award of the diploma.

The Professional Pilot Bachelor's degree alone does not entitle its holder to pursue a career as a professional pilot. One of the award requirements is holding a pilot licence. This licence can be gained after having passed the theoretical and practical exam within the accredited examination system of the Aviation Authority of the National Transport Authority.

The diploma is an official document decorated with the coat of arms of Hungary which verifies the successful completion of studies in the Professional Pilot undergraduate program. The diploma contains the following data: name of HEI (higher education institution); institutional identification number; serial number of diploma; name of diploma holder; date and place of his/her birth; level of qualification; training program; specialization; mode of attendance; place, day, month and year issued. Furthermore, it has to contain the original signature of the Dean (or in case of his/her indisposition the Vice-Dean for Education) and the seal of HEI.

If the candidate does not hold the certificate on the successful completion of the language exam in English in the final exam period, the diploma will be issued after the final exam period. In this case instead of the Dean, the Vice-Dean for Education is also allowed to sign the diploma. The University keeps a record of the diplomas issued.

If the candidate has failed to present the certificate on the successful language exam in English, a certificate on the completion of studies will be issued by the Faculty. The document does not contain any reference to qualification, it merely proves that the candidate has taken a successful final exam. The Faculty keeps a record of the certificates issued.

*Calculating diploma grade*

$$\frac{a + b + c}{3}$$

, where

a = weight grade average, rounded down to two decimal places,

b= average of the grades awarded for the oral part of the final exam, rounded down to two decimal places,

c= grade awarded for thesis defence

#### *Classification of the diploma*

Outstanding	4,81 – 5,00
Excellent	4,51 – 4,80
Good	3,51 – 4,50
Satisfactory	2,51 – 3,50
Pass	2,00 – 2,50

#### *Diploma with Honour*

A diploma with honours is given where a student received

- a student received an excellent grade in all the subjects of the final exam and for the thesis defence,
- a student received excellent for all the comprehensive exams,
- the grade average of all his/her other examination grades and seminar grades is minimum 4.00 or better, and
- a student did not receive a grade lower than satisfactory during all of his/her studies.

