

# ESTONIAN AVIATION ACADEMY

## SYLLABUS

<b>I. GENERAL DATA ON SUBJECT COURSE</b>	
CODE AND NAME OF SUBJECT (in Estonian and English)	Aeronavigatsiooni alused AM.081 <b>Basics of Air Navigation</b>
ACADEMIC YEAR, TERM, FORM OF STUDIES	2018/2019 spring term, daytime studies
CURRICULUM, SPECIALITY AND MODULE WHERE THE SUBJECT BELONGS TO	Aviation Management (2284)
VOLUME OF SUBJECT (ECTS)	2 ECTS
FORM OF CONTROL	non-differentiated
WORKLOAD AND FORMAT OF STUDIES	Contact hours: 26 hrs, independent work: 26 hrs
LANGUAGE OF INSTRUCTION	English (advanced down to Upper Intermediate English – preferable)
ADDITIONAL INFORMATION (prerequisite subject courses, restrictions on participating in the course, etc)	Target group consists of 3rd year (applicable with minor complications for IV semester) undergraduate of the specialty of Aviation Company Management and others who need essential full range navigational knowledge.
LECTURER(s)	Allar Plaksi

<b>II. THE GOAL, LEARNING OUTCOMES AND DESCRIPTION OF SUBJECT COURSE</b>	
GOAL OF SUBJECT COURSE	To enable the undergraduates studying this course to become confident about essential navigation knowledge and to date up navigational systems both, in their jobs and further extension of knowledge. Also get better understanding about aviation as very integrated area, navigation as important part of it.
LEARNING OUTCOMES	By the end of the course students have: <ol style="list-style-type: none"><li>1. Acquired basic navigation terms and concepts sufficient to understand how to navigate.</li><li>2. Developed the skills in using absorbed terms, concepts and make navigational calculations, positioning and measurements;</li><li>3. Learned/got used to handle with ease the most common charts for navigation task and basic navigational aids.</li><li>4. Gained an overview about today's radio navigation systems, their principles, limitations and their options.</li><li>5. Learned to handle and interpret GPS receivers and position with ease.</li></ol>
SUBJECT COURSE DESCRIPTION	The first part of the course is about general (VFR) navigation. The course begins with navigational concept about the Earth and its

	<p>coordinate system. It continues with essential air navigation elements and concepts, giving understanding and practical experience for using them. The course offers additional knowledge of practical usage of current VFR charts and common navigational tools like: 1:500 000 VFR map, plotter, ruler, Jeppessen navigation calculator.</p> <p>The course includes a short overview about controlled aerodrome runway markings and lights. The general navigation part ends with complex understanding of VFR navigation and practical flight preparation.</p> <p>The second, i.e. radio navigation part of the course starts with essential knowledge about radio waves from radio navigational point of view. Then the course covers step-by step the most important contemporary radio navigation aids and equipment and there usage. The navigation aids are covered from VDF to GPS. That part of course gives also idea of instrumental procedures based on PANS-OPS.</p> <p>Reading authentic contemporary materials is requested and recommended.</p> <p>This course gives basic full range air navigational knowledge as a basis for later independent extension of the knowledge. That knowledge is much of what the students are expected to know today when working at an airport or in some other aviation area.</p>
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<b>III. GRADING SYSTEM AND CRITERIA</b>	
PREREQUISITES TO BE ALLOWED TO TAKE EXAMINATION	75% participation is required.
FORMATION OF EXAM MARK/ OF PRELIMINARY EXAM	The course ends with a multiple choice final test.
OPPORTUNITIES FOR SETTling ARREARS	By agreement with the lecturer.
<b>GRADING SYSTEM</b>	<b>RESPECTIVE MARKING CRITERIA</b>
FORMATION OF THE FINAL GRADE	The course ends with a multiple choice final test. Mandatory before fin test: practical, midterm VFR navigation task – enroute navigation preparation by chart, plotter, navigation computer.

<b>IV. TIMETABLE AND LIST OF TOPICS</b>
The class meets once a week for 2 or 3 contact hours each time. The length of 1 contact hour is 45 minutes.

**I General navigation (visual navigation).**

Lesson 1

Topic: The Earth

Introduction. Earth in general. Directions, co-ordinate systems, positioning, lat and long formats, terrestrial magnetism, magnetic dip, variation.

Topic: Directions, Headings, Bearings

Tracks, headings, wind velocity, compasses, compass deviation. Headings calculations. Bearings QDM, QDR

Supplementary: Headings, calculations.

Lesson 2

Topic: Time and time conversions

Apparent time, Local Mean Time, Standard Time, UTC.

Time conversion calculations.

International Dateline.

Determination of sunrise and sunset by AIP table.

Supplementary: Time conversion calculus.

Lesson 3 (semi practical)

Topic: ISA, Speed, Triangle of velocities

International Standard Atmosphere.

Indicated airspeed, true airspeed, ground speed and drift

Mach nr.

Triangle of velocities, methods of its solution (incl. Jeppessen VFR nav. Computer). Headings calculation, dead reckoning.

Supplementary: Speed triangle solving.

Lesson 4 (semi practical)

Topic: Units, Aircraft altitude and height.

Units of distance, speed, volume and mass in navigation. Unit's conversions.

Aircraft altitude, height, FL, altimeter pressure settings QNH, QFE, QNE. Altitude corrections.

Supplementary: Units conversation.

Lesson 5 (practical)

Topics: Current aeronautical VFR charts and their usage.

Positioning, measurement tracks and distances, heights, plotting. Current VFR chart properties, features, topography.

Supplementary: Practical navigational en-route tasks on charts.

Topic: VFR flight preparation from navigational point of view.

Navigational flight plan preparation using current VFR chart, Estonian AIP. DR elements calculation.

Supplementary: VFR flight preparation.

**II Radio navigation.**

Lesson 6

Topic: Introduction to radio navigation, radio waves in general.

Difference between VFR and IFR flight navigation. Radio waves bands, general properties and usage in navigation and aviation.

Topic: Radio aids and procedures. Essential about instrumental procedures and there elements based on PANS-OPS.

Topic (briefly): VDF; NDB and ADF

VDF, principles, presentation and interpretation. Bearings, homing, tracking. Accuracy.

NDB and ADF principles, presentation and interpretation. Bearings, homing, tracking, procedures. Accuracy.

Supplementary activity: Mid-term exam on the topics discussed

Lesson 7

Topic: Radio aids and procedures. VOR- DME

VOR principles, presentation and interpretation. Usage, procedures. Accuracy.

VOR-DME pairing. DME, principles, presentation and interpretation. Usage, procedures. Accuracy.

Supplementary activity: training test

Lesson 8

Topic: Radio aids and procedures. ILS

ILS system components (LOC, Glide path, markers, DME). Principles, presentation and interpretation. Usage, procedures, accuracy.

Supplementary activity: training test

Lesson 9 (Briefly)

Topic: Radio aids and procedures. Primary Radars and secondary radars

Radar principles, pulse techniques. Ground radars.

Secondary radars DME, SSR. Principles, presentation and interpretation. Usage, procedures. Accuracy.

Supplementary activity: training test

Lesson 10 (semi practical)

Topic: Satellite navigation (GPS and it's augmentation - ABAS; SBAS,GBAS)

GPS System design, segments, principle of operation, receivers, usage. Procedures. Laboratory practice.

Supplementary activity: training test

Consultation: Varia, Revision, final test preparation.

Supplementary activity: revision test

**Literature**

- The course drawings, schemes and explanatory materials are distributed in handouts and also e-materials are partly available. Charts, plotters and navigation computers are distributed to students when needed.
- Air Navigation, Volume 3, Air Pilot's Manual 3 2008, Poole's Air Pilot Publishing Ltd, UK ISBN 1 84336 067 5.
- Radio Navigation & Instrument Flying, Air Pilot's Manual 5, 2007, ... ISBN 1 84336 069 1
- Albert Helfrick, Principles of Avionics, 2002, Avionics Communications Inc. USA.
- "GNSS for Civil aviation" 2010 by Leho Roots e-course (materials usage).
- Navigation1 General Navigation, Theoretical Training Manuals, Oxford Aviation Services Limited 2007.
- Navigation2 Radio Navigation, Theoretical Training Manuals, Oxford Aviation Services Limited 2007.
- Avionics Navigation Systems, Myron Kayton & Walter R. Fried Wiley-Interscience Publication 1997.
- Jeppesen Airway Manual (Student Pilot Route Manual for JAR-Flight Crew Licensing 2002 Jeppesen Sanderson, Inc.

**Additional sources suggested:**

- Plenty of professional journals available in the Academy Library. Also: lots of the same titles and more are accessible online. In case of some special interest or necessity, feel free to contact the course instructor.