# LETALSKA NAVIGACIJA 2

# UČNI NAČRT PREDMETA/COURSE SYLLABUS

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| **Predmet:** | Letalska navigacija 2 |
| **Course title:** | AIR NAVIGATION 2 |
| **Članica nosilka/UL Member:** | UL FS |

| Študijski programi in stopnja | Študijska smer | Letnik | Semestri | Izbirnost |
|---|---|---|---|---|
| Strojništvo - projektno aplikativni program, prva stopnja, visokošolski strokovni | Prometni pilot letala/helikopterja (smer) | 3. letnik | 2. semester | obvezen |

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| **Univerzitetna koda predmeta/University course code:** | 0564005 |
| **Koda učne enote na članici/UL Member course code:** | 3088-V |

| Predavanja /Lectures | Seminar /Seminar | Vaje /Tutorials | Klinične vaje /Clinical tutorials | Druge oblike študija /Other forms of study | Samostojno delo /Individual student work | ECTS |
|---|---|---|---|---|---|---|
| 35 | | 30 | | | 35 | 4 |

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| **Nosilec predmeta/Lecturer:** | Andrej Grebenšek |
| **Vrsta predmeta/Course type:** | Izbirni strokovni predmet /Elective specialised course |

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| **Jeziki/Languages:** | Predavanja/Lectures: | Slovenščina |
| | Vaje/Tutorial: | Slovenščina |

**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:** **Prerequisites:**

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| Izpolnjevanje pogojev za vpis v Visokošolski strokovni študijski program I. stopnje Strojništvo - Projektno aplikativni program. | Meeting the enrollment conditions for the MECHANICAL ENGINEERING - Project Oriented Applied Programme. |

| **Vsebina:** | **Content (Syllabus outline):** |
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| 1. Predavanje:<br>- Lastnosti radijskih valov.<br>2. Predavanje:<br>- Teorija širjenja radijskih valov.<br>3. Predavanje:<br>- Modulacija;<br>- Antene;<br>- Dopplerjevi radarski sistemi.<br>4. Predavanje:<br>- Visokofrekvenčni iskalnik smeri (VDF).<br>5. Predavanje:<br>- Samodejni iskalnik smeri (ADF).<br>6. Predavanje:<br>- Visokofrekvenčni vsesmerni oddajnik (VOR).<br>7. Predavanje:<br>- Instrumentalni sistem za pristajanje (ILS).<br>8. Predavanje:<br>- Mikrovalovni sistem za pristajanje (MLS).<br>9. Predavanje:<br>- Osnove radarja;<br>- Zemeljski radar.<br>10. Predavanje:<br>- Vremenski radar;<br>- Nadzorni radar (SSR).<br>11. Predavanje:<br>- Oprema za merjenje razdalje (DME).<br>12. Predavanje:<br>- Področna navigacija (RNAV).<br>13. Predavanje:<br>- Elektronski informacijski sistem o letu (EFIS).<br>14. Predavanje:<br>- Globalni navigacijski satelitski sistem (GNSS).<br>15. Predavanje:<br>- Navigacija na podlagi zmogljivosti (PBN). | 1. Lecture :<br>- Properties of radio waves .<br>2. Lecture :<br>- Radio wave propagation theory .<br>3. Lecture :<br>- Modulation ;<br>- Antenna ;<br>- Doppler radar systems .<br>4. Lecture :<br>- VHF direction finder (VDF).<br>5. Lecture :<br>- Automatic direction finder (ADF).<br>6. Lecture :<br>- High Frequency Omni-directional Transmitter (VOR).<br>7. Lecture :<br>- Instrument landing system (ILS).<br>8. Lecture :<br>- Microwave landing system (MLS).<br>9. Lecture :<br>- Radar basics ;<br>- Ground radar .<br>10. Lecture :<br>- Weather radar;<br>- Surveillance radar (SSR).<br>11. Lecture :<br>- Distance measuring equipment (DME).<br>12. Lecture :<br>- Area Navigation (RNAV).<br>13. Lecture :<br>- Electronic flight information system (EFIS).<br>14. Lecture :<br>- Global Navigation Satellite System (GNSS).<br>15. Lecture :<br>- Performance based navigation (PBN). |

**Temeljna literatura in viri/Readings:**

1. RADIO NAVIGATION, ATPL GROUND TRAINING SERIES, CAE Oxford Aviiation Academy, BOOK ELEVEN, EASA FIRST EDITION, REVISED FOR NPA 29, 2016
2. PERFORMANCE-BASED NAVIGATION (PBN) ATPL GROUND TRAINING SERIES, CAE Oxford Aviiation Academy, BOOK ELEVEN, EASA FIRST EDITION, REVISED FOR NPA 29, 2016
3. EASA ATPL Training, Radio navigation, Jeppesen, 2019
4. Učna gradiva iz predmeta Letalska navigacija 2, e-učilnica Fakulteta za strojništvo, 2019

| **Cilji in kompetence:** | **Objectives and competences:** |
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| Cilji:<br>1. Prepoznavanje načinov izvajanja radio navigacije<br>2. Prepoznavanje nevarnosti pri radio navigaciji<br>3. Sposobnost povezovanja snovi iz radio navigacije z ostalimi letalskimi predmeti<br>Kompetence:<br>1. S1-PAP, S2-PAP: Sposobnost prepoznavanja načinov izvajanja radio navigacije.<br>2. S4-PAP, S14-PAP: Sposobnost prepoznavanja nevarnih situacij v radio navigaciji.<br>3. P1-PAP: Sposobnost razumevanja radio navigacije in povezovanja z drugimi letalskimi tematikami. | Objectives :<br>1. Identifying ways of implementation of radio navigation<br>2. Identifying hazards in the radio navigation<br>3. Ability integration substances from the radio navigation with other aviation items<br>Competencies :<br>1. PAP-S1, S2-PAP: Ability to recognize principles of the implementation of radio navigation .<br>2. S4-PAP, S14-PAP: Ability to identify hazardous situations in radio navigation.<br>3. P1-PAP: Ability to understand radio navigation and connect with other aviation topics. |

| **Predvideni študijski rezultati:** | **Intended learning outcomes:** |
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| Znanja:<br>Z1: Poglobljeno poznavanje radio navigacije in radio navigacijskih sistemov in sredstev.<br>Spretnosti:<br>S1.1: Sposobnost vrednotenja in razumevanja radio navigacije, prepoznavanje nevarnih situacij v radio navigaciji, možnih odpovedi sistemov in povezovanje snovi z ostalimi tematikami iz letalstva.<br>S1.2 Izvajanje kompleksnih operativno-strokovnih opravil, ki vključujejo tudi uporabo metodoloških orodij.<br>S1.3 Obvladovanje zahtevnih, | Knowledge:<br>Z1: In-depth knowledge of radio navigation and radio navigation systems and assets .<br>Skills :<br>S1.1 : The ability evaluation and understanding of radio navigation , identification of dangerous situations in radio navigation, recognition and awarness of possible failure of systems and linking subjects with other topics from aviation .<br>S1.2 Executing complex operationa-professional tasks that incorporate usage of methodological tools. |

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| kompleksnih delovnih procesov ob samostojni uporabi znanja v novih delovnih situacijah.<br>S1.4 Diagnosticiranje in reševanje problemov v različnih specifičnih delovnih okoljih, povezanih s področjem izobraževanja in usposabljanja.<br>S1.5 Osnova za izvirna dognanja/ stvaritve in kritično refleksijo. | S1.3 Mastering demanding and complex work processes by independent usage of knowledge in new working situations.<br>S1.4 Problem diagnostics and solving in different and specific working environments that are linked to the teaching and training content.<br>S1.5 Basis for unique innovations and critical reflections. |

| **Metode poučevanja in učenja:** | **Learning and teaching methods:** |
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| P1 Avditorna predavanja z reševanjem izbranih - za področje značilnih - teoretičnih in praktično uporabnih primerov.<br>P2 Obravnava snovi po urejeni in vnaprej razloženi sistematiki.<br>P3 Avditorne vaje, kjer se teoretično znanje s predavanj podkrepi z računskimi primeri.<br>P6 Interaktivna predavanja<br>P7 Študij literature in razprava<br>P8 Izdelava in predstavitev aplikativnih seminarskih nalog | P1 Auditorial lectures with solving selected field-specific theoretical and applied use cases.<br>P2 Presenting the content according to the explained system.<br>P3 Auditorial exrecises, in which theoretical content from the lectures is supplemented with practical examples.<br>P6 Interactive lectures.<br>P7 Literature study and discussion.<br>P8 Making and presenting applied seminar exercises. |

| **Načini ocenjevanja:** | **Delež/ Weight** | **Assessment:** |
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| Teoretične vsebine (predavanja): | 50,00 % | Theoretical content (lectures): |
| Samostojno delo na vajah: | 50,00 % | Independent work in exercises: |

**Reference nosilca/Lecturer's references:**

Andrej Grebenšek

1. **GREBENŠEK, Andrej**, MAGISTER, Tone. Benchmarking of Air navigation services providers by the use of composite flight hours; true or false? : Elektronski vir. Engineering management research. 2014, vol. 3, no. 1, str. 1-7. ISSN 1927-7318. DOI: 10.5539/emr.v3n1p [COBISS.SI-ID 2459491]
2. **GREBENŠEK, Andrej**, MAGISTER, Tone. Traffic variability in benchmarking of air navigation services providers cost-effectiveness. International journal for traffic and transport engineering : IJTTE. [Print ed.]. 2012, vol. 2, no. 3, str. 185-201. ISSN 2217-544X. [COBISS.SI-ID 2293859]
3. **GREBENŠEK, Andrej**, MAGISTER, Tone. Effect of seasonal traffic variability on the performance of air navigation service providers. Journal of air transport management. 2012, vol. 24, 8 str. ISSN 0969-6997.

http://dx.doi.org/10.1016/j.jairtraman.2012.04.003, DOI: 10.1016/j.jairtraman.2012.04.00 [COBISS.SI-ID 2293347]
4. **GREBENŠEK, Andrej**, KOSEL, Tadej. Is economy of scale in air navigation services provision really always the best choice?. V: INAIR 2015 Conference, Amsterdam, November 12th & 13th, 2015. Žilna: [s. n.], 2015. Datoteka grebensek, kosel.pdf (7 f.). [COBISS.SI-ID 14399771]