

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	RAZVOJNI POSTOPKI V LETALSTVU
Course title:	DESIGN AND DEVELOPMENT PRINCIPLES IN AVIATION ENGINEERING

Študijski programi in stopnja	Študijska smer	Letnik	Semestri
Strojništvo, tretja stopnja, doktorski	Konstruktivno mehanske inženirske znanosti (smer)		Celoletni

Univerzitetna koda predmeta/University course code:

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samostojno delo	ECTS
90					160	10

Nosilec predmeta/Lecturer:

Izvajalci predavanj:	<input type="text" value="Tadej Kosel"/>
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:

Jeziki/Languages:	Predavanja/Lectures:	Slovenščina, Angleščina
	Vaje/Tutorial:	Slovenščina, Angleščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Veljajo splošni pogoji za doktorski študij.	General prerequisites for the third level studies.

Vsebina:

- Evolucija letalskih struktur (gradiva, tehnologija, zmogljivosti)
- Tipologija in sistematika letal (uporaba, geometrija, komponente)
- Osnove konstruiranja letal (principi, specifikacije, predpisi)
- Obremenitve letala (osnove, bremena v letu, na zemlji)
- Napetosti v strukturi (strižne, natezne, torzijske)
- Deformacije
- Stabilnost konstrukcijskih elementov
- Gradiva v letalstvu (lastnosti, tehnologija, preizkusi)
- Osnovni elementi gradnje in sistemi
- Različne konfiguracije letal (z repom, leteče krilo, kanard, tandem krilo)
- Uporaba kompozitnih gradiv (laminati, satovje, vlakna)
- Konstruiranje posameznih delov letala
- Pregled strukture letala

Content (Syllabus outline):

- Evolution of aircraft structures (materials, technology, performance)
- Typology and systematic of aircraft (usage, geometry, components)
- Design principles of aircraft (principles, specifications, requirements)
- Loads (air loads, ground loads)
- Stresses in airframe (shear, normal, torsional)
- Deformations
- Stability of constructional elements
- Aircraft parts and systems
- Airplane concepts (tailed, flying wing, canard, tandem wing)
- Materials in aircraft design (characteristics, technology, tests)
- Usage of composite materials (laminates, honeycomb, fibers)
- Design of aircraft parts
- Inspection of airframe

<ul style="list-style-type: none"> • Tehnične publikacije v letalstvu • Standardni letalski deli • Popravila strukture letal 	<ul style="list-style-type: none"> • Technical publications in aviation engineering • Repair of airframe • Standard parts in aircraft design
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Temeljna literatura in viri/Readings:

<p>[1] Bruhn, E.F.: Analysis and Design of Flight Vehicle Structures, Jacobs Publishing, 1973</p> <p>[2] Charles J.A., Crane F.A.A. and Furness: Selection and use of engineering materials, Butterworth Heinemann 1997</p> <p>[3] Dowell, E.H.: A Modern Course in Aeroelasticity, Kluwer Academic Publishers, 1995</p> <p>[4] Nicolai, L.M.: Fundamentals of Aircraft Design, METS, Inc., 1975</p> <p>[5] Niu, M.C.Y.: Airframe Structural Design, Hong Kong Conmilit Press, 1997</p> <p>[6] Niu M.C.Y.: Composite airframe structures, Hong Kong Conmilit Press Ltd, 1996</p> <p>[7] Perry D.J. & Azar J.J.: Aircraft Structures, McGraw-Hill, 1982</p> <p>[8] Raymer, D.P.: Aircraft Design: A Conceptual Approach, AIAA, 1992.</p> <p>[9] Roskam J.: Airplane Design, Part I/II/III/IV/V/VI/VII, Roskam Aviation and Engineering Corporation 1997</p> <p>[10] Stinton D.: The Design of the Airplane, Blackwell Science, 1995</p> <p>[11] Torenbeek E.: Synthesis of Subsonic Airplane Design, Kluwer Academic Press, 1982</p> <p>[12] Wilkinson R.: Aircraft Structures & Systems, Longman 1996</p> <p>[13] Atluri S.N., Sampath S.G., Tong P.: Structural Integrity of Aging Airplanes, Springer-Verlag 1990</p> <p>[14] Baker A.A., Jones R.: Bonded Repair of Aircraft Structures, Martinus Nijhoff Publishers 1988</p> <p>[15] Bifolchi : Aircraft Maintenance and Repair, 1987</p> <p>[16] Douglas C. L.: Nondestructive Testing for Aircraft, Jeppesen Sanderson 1994</p> <p>[17] Jeppesen: Advisory Circular – Acceptable Methods, Techniques, and Practices- Aircraft Inspection and Repair, 1998</p> <p>[18] Jeppesen: Standard Aviation Maintenance Handbook, Jeppesen Sanderson 1985</p>

Cilji in kompetence:

<p>Cilji: Študentu prikazati postopek snovanja majhnih (splošne kategorije) in ultralahkih letal ter brezpilotnih letal od idejne zasnove do letečega prototipa. Študent se seznami z vsemi sestavnimi deli in sistemi na letalu ter njihovo medsebojno povezovanje v celoto. Seznan se z različnimi načini gradnje (lesena, kovinska, kompozitna) in s predpisi (JAR 23, JAR VLA), ki jih je potrebno upoštevati pri snovanju letal. Na koncu spozna načine pregledov in popravil letalskih struktur ob poškodbah le teh.</p> <p>Kompetence: Študent osvoji vsa potrebna znanja v procesu snovanja majhnih letal in brezpilotnih letal.</p>	<p>Objectives and competences:</p> <p>Goals: Principal goal is to learn about design of general aviation aircrafts, ultralight airplanes and unmanned aerial vehicles from idea to prototype. Student learn about standard aircraft parts and systems and their integration to airplane. Different types of design (wooden, metal, composite) and regulations (JAR 23, JAR VLA etc.) for airplane design will be discussed. After all the inspection methods and airframe repair methods will be shown.</p> <p>Competences: Student acquires knowledge for general aviation and ultralight airplane design and design of unmanned aerial vehicles.</p>
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Predvideni študijski rezultati:

<p>Študent osvoji vsa potrebna znanja v procesu snovanja majhnih letal in brezpilotnih letal.</p>	<p>Intended learning outcomes: Student acquires knowledge for general aviation and ultralight airplane design and design of unmanned aerial vehicles.</p>
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Metode poučevanja in učenja:

<p>Predavanja, laboratorijske vaje, seminarsko delo, e-izobraževanje, konzultacije. Seminarsko delo v čim večji meri navezuje se na področje doktorskega raziskovanja. Študij z uporabo priporočene literature.</p>	<p>Learning and teaching methods: Lectures, laboratory practice & seminar work, e-education, consulting. The seminar work is related, as much as possible, to the student's doctoral research field. Study on a recommended literature basis.</p>
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Načini ocenjevanja:

<p>Način (seminar, naloge, ustni izpit) • Seminar (40%) • Naloge (30%) • Ustni izpit (30%)</p>	<p>Delež/Weight</p>	<p>Assessment: Method (seminar, assignments, oral examination) • seminar (40%) • assignments (30%) • oral examination (30%)</p>
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Reference nosilca/Lecturer's references:

izr.prof..dr. Tadej KOSEL

VIŠNJIĆ, Goran, NOŽAK, Dejan, KOSEL, Franc, KOSEL, Tadej. Reducing shear-lag in thin-walled composite I-beam wing spars. *Aircraft Engineering*, ISSN 0002-2667, 2014, vol. 86, iss. 2, str. 89-98, doi: 10.1108/AEAT-09-2012-0153.

SODJA, Jurij, DRAŽUMERIČ, Radovan, KOSEL, Tadej, MARZOCCA, Pier. Design of flexible propellers with optimized load-distribution characteristics. *Journal of aircraft*, ISSN 0021-8669, Jan./Feb. 2014, vol. 51, no. 1, str. 117-128, ilustr., doi: 10.2514/1.C032131.

SODJA, Jurij, STADLER, Domen, KOSEL, Tadej. Computational fluid dynamics analysis of an optimized load-distribution propeller. *Journal of aircraft*, ISSN 0021-8669, 2012, vol. 49, no. 3, str. 955-961, ilustr.