

Univerza v Ljubljani
Fakulteta *za strojništvo*



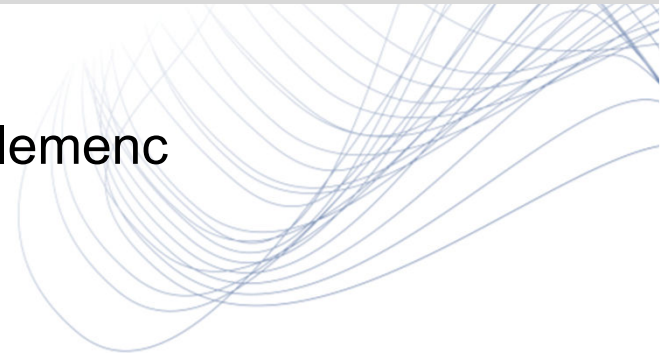
Katedra za strojne elemente
in razvojna vrednotenja



DINAMIKA VOZIL – Uvod

VEHICLE DYNAMICS – Introduction

Prof. dr. Jernej Klemenc





Osnovni podatki / *Basic facts*

- Število ur predavanj / *No. of lecture hours*: **30**
- Število ur vaj / *No. of exercise hours*: **30**
- Pričetek predavanj / *Beginning of lectures*: **12:00**
- Predavatelj / *Lecturer*: **prof. dr. Jernej Klemenc**
 - Soba predavatelja / *Lecturer's room*: **508**
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- Asistent / *Assistant*: **as. dr. Simon Oman**
 - Soba asistenta / *Assistant's room*: **506**
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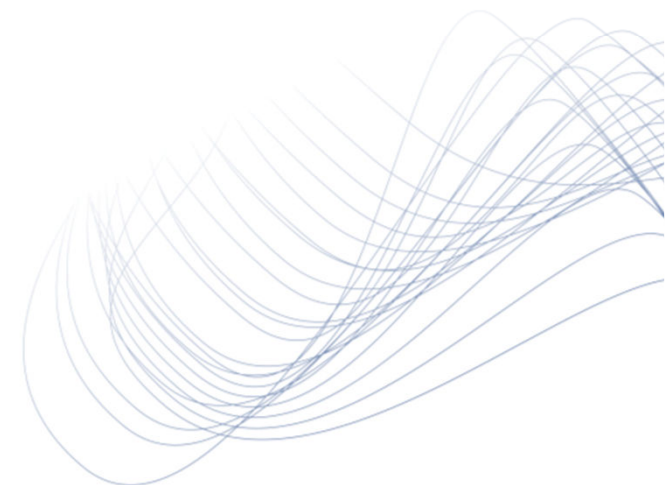
Študijski in izpitni red / *Study rules*

- 2 kolokvija iz snovi predavanj.
- 3 vaje:
 - 1. vaja: Dinamična karakteristika vozila pri pospeševanju in vožnji s konstantno hitrostjo
 - 2. vaja: Zaviranje vozila
 - 3. vaja: Vertikalni odziv vozila ob naletu na oviro
- *2 colloquia from theoretical content.*
- *3 exercises:*
 - *1st exercise: Dynamic characteristics of a vehicle during acceleration or driving with a constant velocity.*
 - *2nd exercise: Braking of the vehicle.*
 - *3rd exercise: Vertical response of a vehicle when driving over obstacle*



Študijski in izpitni red / *Study rules*

- Zahtevana prisotnost na vajah je 80%.
- Pozitivna ocena vaj je pogoj za pristop k izpitu in pridobitev ocene iz predmeta.
- *Obligatory presence at exercises is 80%.*
- *Positive grade from exercises is a prerequisite for attending the written and oral (optional) part of the exam at the end of the course.*





Študijski in izpitni red / Study rules

- Pridobitev ocene pri predmetu “Efektivnost izdelkov”:
 - (1) Povprečna ocena obeh kolokvijev je večja od 5.5, pri čemer noben kolokvij ni slabši od 4.5. Za vpis ocene se študent **MORA** prijaviti na izpit do konca šolskega leta, da bo ocena vpisana v VIS.
 - (2) Povprečna ocena obeh kolokvijev je nižja od 5.5, pri čemer je en kolokvij pozitiven. Na prvem izpitnem roku v tekočem šolskem letu, na katerega se študent prijavi, se preverja le znanje iz snovi, slabšega od kolokvijev.
- *How to pass the „Effectiveness of Products“ course:*
 - (1) *An average grade from colloquia is bigger or equal to 5.5, with no grade less than 4.5. To get the grade in VIS information system, a student needs to enrol her/himself for the course exam until the end of the school year.*
 - (2) *The average grade from colloquia is less than 5.5 and one colloquium is positive. At the first exam to which the student is enrolled only a content of the worse colloquium is checked.*



Študijski in izpitni red / *Study rules*

- Načini pridobitve ocene pri predmetu “Efektivnost izdelkov” (nadaljevanje):
 - (3) Študent je bil na kolokvijih prisoten, a ni bil uspešen v smislu točk (1) ali (2). Na prvem izpitnem roku v tekočem šolskem letu, na katerega se študent prijavi, mu je omogočeno preverjanje znanja le iz teoretičnega dela snovi. Nalog na tem izpitnem roku ne piše.
 - (4) Če študent ne izkoristi ene izmed zgornjih treh variant, potem na izpitu piše teoretični del snovi in naloge.
- *How to pass the „Effectiveness of Products“ course (continuation):*
 - (3) *Although present, a student was not successful at the two colloquia as described in options (1) or (2). At the first exam to which the student is enrolled only the theoretical content of the course is checked. The student receives no questions related to the exercises.*
 - (4) *Full exam proof: theoretical content and exercises.*



Vsebina predmeta / Course content

- Interakcija: vozilo, uporabnik, obratovalni pogoji. Učinkovitost vozila.
- Vozni upori, motorna karakteristika, mehanska transmisija, bilanca vlečnih sil, hibridni pogon.
- Gibalna enačba vozila.
- Ravnotežje sil in mejne obremenitve vozila.
- Tipi vzmetenja za nadgradnjo in dinamični model vozila.
- *Interaction: vehicle, user, operating conditions. Vehicle effectiveness.*
- *Diving resistances, engine characteristics, mechanical transmission, traction forces balance, hybrid transmission.*
- *Equation of motion and maximum tractive effort.*
- *Chassis suspension types and dynamic model of a vehicle.*



Vsebina predmeta / Course content

- Elementi mehanske transmisije: motor, sklopka, menjalnik, kotno gonilo, diferencial, kolo.
- Kolo kot vez med kolesi in cestiščem.
- Diferencial in kotno gonilo.
- Menjalnik s prestavami, menjalnik z zvezno spremenljivim prestavnim razmerjem, razdelilnik pogona.
- Postavitev vodilnih koles - stekanje.
- *Elements of a mechanical transmission system: driving engine, clutch, gear box, differential gear drive, tyre.*
- *Tyre as a link between a ground surface and the wheels.*
- *Differential and angle gear drive.*
- *Gear box a with fixed number of gears, CVT, power splitter.*
- *Tyre alignment angles.*



Seznam literature / *List of references*

- Klemenc J.: Dinamika vozil – predloge k predavanjem. Ljubljana: UL-FS, 2016. (in Slovene language)
- Proceedings of Wprld Automotive Congress FISITA 2014. Maastricht: KIVI NIRA, 2014.
- Lewis R., Olofsson U. (editors): Wheel-rail interface handbook. Boca Raton: Woodhead Publishing in Mechanical Engineering, 2009.
- Wong J.Y.: Theory of Ground Vehicles, 3rd edition. New York: John Willey & Sons, 2001.
- Gillespie T.D.: Fundamentals of Vehicle Dynamics. Warrendale: SAE, 1992.
- Simić D.: Motorna vozila. Beograd: Naučna knjiga, 1988. (in Serbian language)
- Janičijević N., Janković D., Todorović J.: Konstrukcija motornih vozila. Beograd: Mašinski fakultet, 1979. (in Serbian language)