MARDS Training workshop
„Quality Assurance of Doctoral Studies"

Assoc. Prof. Dr. Matjaž DEBEVC

University of Maribor

Univerza v Mariboru
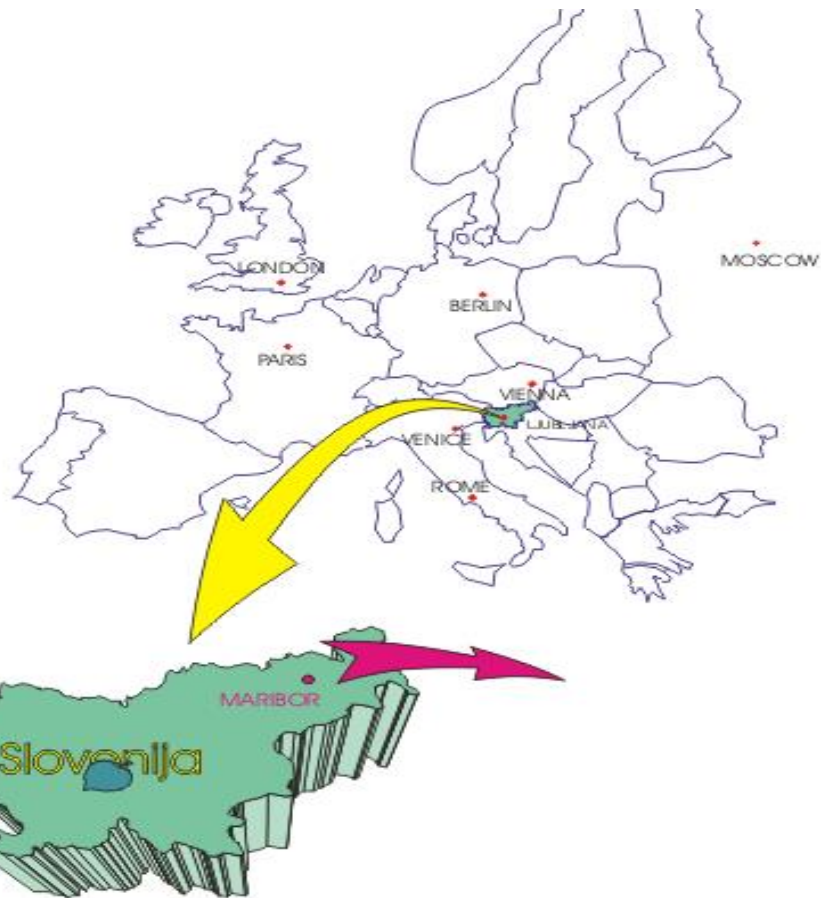
Maribor

University of Maribor - History

1859   First School of Theology, established by bishop Anton Martin Slomšek

1959-1961   Independent Higher Education Institutions

1975   University of Maribor – Faculties Independent Legal Entities

1993   University of Maribor – Only Legal Entity

2008   University of Maribor – Present Stage

University of Maribor - Faculties

1. Faculty of Business and Economics
2. Faculty of Mechanical Engineering
3. Faculty of Chemical Engineering
4. Faculty of Civil Engineering
5. Faculty of Electrical Engineering Computer Science and Informatics
6. Faculty of Agriculture
7. Faculty of Law
8. Faculty of Education
9. Faculty of Organizational Sciences
10. Faculty of Criminal Justice
11. Faculty of Medicine
12. Faculty of Logistics
13. Faculty of Health Sciences
14. Faculty of Arts
15. Faculty of Natural Sciences and Mathematics
16. Faculty of Energetics
17. Faculty of Tourism

No. of students: cca. 15.000
Employees: cca. 1.800

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Study system at UM

Levels/ Cycles	Types of SP	Duration of SP in years	Number of credits ECTS
1st level	Professionally Oriented	3	180
	Academic	3	180
2nd level	Master	2	120
3rd level	Ph. D.	3	180

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Training Programme – 7. Nov. 2019

09:15-10:30   Modern structure of doctoral programmes and experience at University of Maribor
(Prof. Dr. Zoran Ren)

10:30-11:00   *Coffee break*

11:00-12:00   Importance and establishment of partnership doctoral candidate - mentor(s) – University
(Prof. Dr. Damijan Mumel)

12:00-13:00   Systemic quality assurance of doctoral studies
(Prof. Dr. Nataša Vaupotič)

13:00-14:30   *Lunch break*

14:30-15:30   Doctoral student's experience

15:30-16:30   Workshop – Discussion & Questions
– moderated by Prof. Dr. Zoran Ren and doctoral student

16:30-17:00   *Coffee break*

17:00–17:30   Summarizing Day 1

Training Programme – 8. Nov. 2019

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09:00-10:00	Development of doctoral programmes in agriculture and agricultural economics *(Prof. Dr. Črtomir Rozman)*
10:00-11:00	Use of modern digital technologies in agriculture in Slovenia *(Prof. Dr. Denis Stajnko)*
11:00-11:30	*Coffee break*
11:30-12:00	Increasing employability of doctorates in emerging sectors with soft skills training *(Irena Lovrenčič Držanič)*
12:00-14:00	Workshop and summarizing Day 2, final discussion

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Lunch
(donated by Institute for Media Communication)

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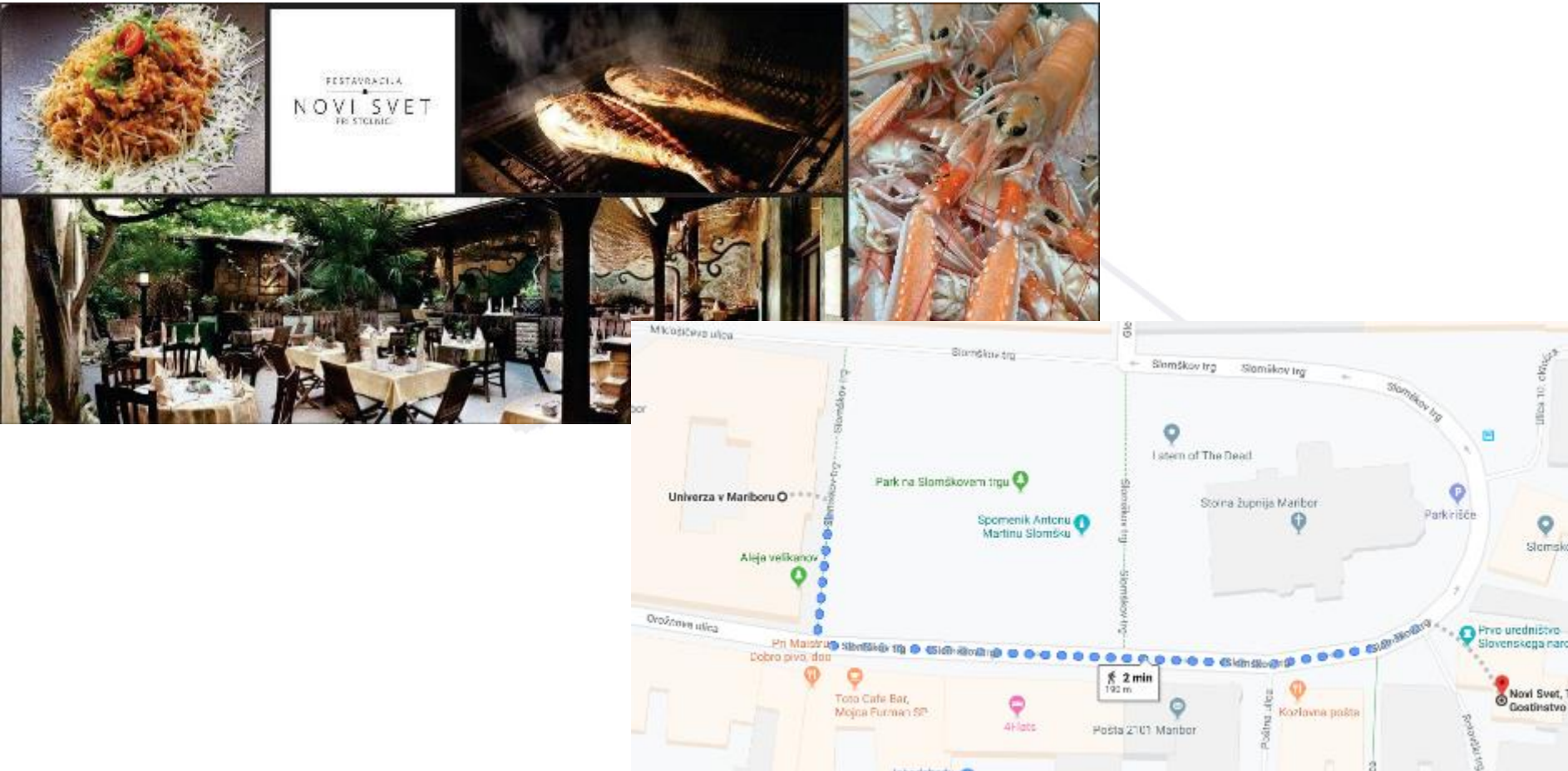
Writing Learning Outcomes
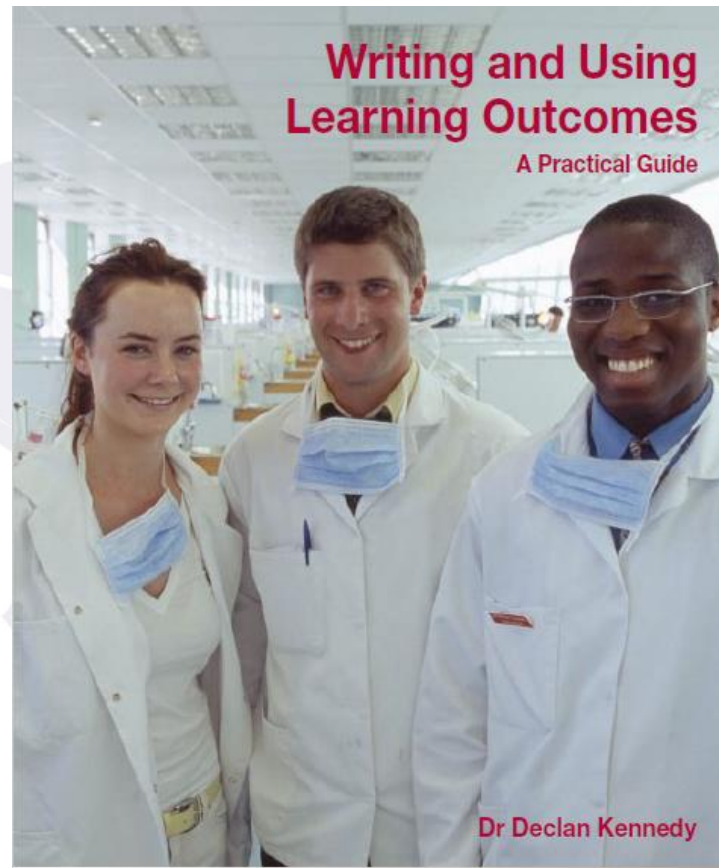
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Course Syllabus – Example – Part 1

Univerza v Mariboru

FERI

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Vgrajeni in vseprisotni računalniški sistemi
Course title:	Embedded and Ubiquitous Computer Systems

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Računalništvo in informatika, 3. stopnja Computer Science and Informatics,3rd degree		1.	zimski, poletni Autumn, Spring

Vrsta predmeta / Course type: Izbirni / Optional

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samostojno delo Individual work	ECTS
45		15			240	10

Nosilec predmeta / Lecturer: Matjaž Colnarič

Jeziki / Languages:	Predavanja / Lectures:	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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Course Syllabus – Example – Part 2

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

Ni pogojev.

Prerequisites:

None.

Vsebina:

- Osnovni koncepti vgrajenih sistemov: čas v vgrajenih računalniških sistemih, specifične lastnosti: pravočasnost, napovedljivost, zanesljivost, omejena sredstva. Vrste sistemov v realnem času.
- Opravila: življenjski cikel, večopravilnost, sinhronizacija med opravili v realnem času, razvrščanje opravil v realnem času.
- Specifične značilnosti aparaturne, programske opreme in komunikacij v realnem času.
- Specifično področje uporabe vgrajenih sistemov: vseprisotne (ubikvitarne) aplikacije.
- Podporne tehnologije: komunikacijska podpora (brezžična omrežja), povezovalni nivo, periferne enote, mobilno računalništvo.
- Spontana omrežja, lokalizacija, identifikacija.
- Višje komponente vgrajenih in vseprisotnih informacijskih sistemov (npr. podatkovne baze v realnem času).
- Netehniški vidiki vseprisotnih sistemov (pravni, sociološki, varnostni).

Content (Syllabus outline):

- Basic concepts of embedded systems: time in embedded computer systems, specific properties – timeliness, predictability, dependability, limited resources. Types of real-time systems.
- Tasks: life cycle, multitasking, synchronisation among real-time tasks, task scheduling under real-time constraints.
- Specific properties of real-time hardware, software and communications.
- Specific domain of embedded applications: ubiquitous systems.
- Supporting technologies: communication support (wireless networks), middleware, peripheral units, mobile computing.
- Spontaneous networks, localisation, identification.
- Higher-level components of embedded and ubiquitous systems (e.g., real-time data bases).
- Non-technical aspects of ubiquitous systems (legal, social, security).

Temeljna literatura in viri / Readings:

- M. Colnarič, D. Verber, W. A. Halang: *Distributed Embedded Control Systems: Improving Dependability with Coherent Design*, Springer Verlag, London, 2008.
- A. Burns, A. Wellings: *Real-Time Systems and Programming Languages*, Addison Wesley, Boston MA, 2001.
- J. Cooling: *Software Engineering for Real-Time Systems*, Addison Wesley, Boston MA, 2002.
- F. Adelstein, S. KS Gupta, G. Richard III, L. Schwiebert: *Fundamentals of Mobile and Pervasive Computing*. McGraw-Hill, New York, 2004.

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Course Syllabus – Example – Part 3

Cilji in kompetence:

Podati smernice za snovanje vgrajenih sistemov in aplikacij. Predstaviti osnove in delovanje vseprisotnih računalniških sistemov.

Objectives and competences:

To present guidelines for design of embedded systems and applications. To introduce basics and operation of ubiquitous computer systems.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben
- prepoznati, analizirati in specificirati realno-časovne zahteve aplikacije,
- analizirati zahteve za aparaturne in programske komponente za gradnjo vgrajenih sistemov,
- zasnovati vgrajene aplikacije,
- zasnovati vseprisotne informacijske sisteme.

Prenosljive/ključne spretnosti in drugi atributi:

- *Spretnosti komuniciranja*: priprava poročila o seminarskem delu, predstavitev rezultatov.
- *Uporaba informacijske tehnologije*: programske in aparaturne tehnologije za porazdeljene vgrajene sisteme, komunikacija v vseprisotnih informacijskih sistemih.
- *Reševanje problemov*: prepoznavanje možnosti uporabe vgrajenih in vseprisotnih rešitev.
- *Delo v skupini*: sodelovanje s specialisti na posameznih področjih.

Intended learning outcomes:

Knowledge and understanding:

On completion of this course the student will be able to
- recognise, analyse and specify real-time requirements of an application,
- analyse requirements for hardware and software components of embedded systems design,
- design embedded applications,
- design ubiquitous information systems.

Transferable/Key skills and other attributes:

- *Communication skills*: preparation of the seminar report, presentation of results.
- *Use of information technology*: software and hardware technologies for distributed embedded systems, communication in ubiquitous information systems.
- *Problem solving*: recognition of possible solutions with embedded and ubiquitous approach.
- *Working in a group*: collaboration with specialists in specific areas.

Metode poučevanja in učenja:
- predavanja,
- projektno delo.

Learning and teaching methods:
- lectures,
- project work.

Načini ocenjevanja:

	Delež (v %) / Weight (in %)	Assessment:
opravljeno in predstavljeno projektno delo,	50%	accomplished and presented project work,
ustni izpit.	50%	oral examination.

Kick-off Meeting, Montenegro, February 2019

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Course Syllabus – Example – Part 4

Reference nosilca/Lecturer's references:

COLNARIČ, Matjaž, VERBER, Domen, HALANG, Wolfgang A.. *Distributed embedded control systems : improving dependability with coherent design*, (Advances in industrial control). Hagen: Springer, cop. 2010. XVII, 250 str., ilustr. ISBN 978-1-84996-715-0. ISBN 978-1-84800-052-0. [COBISS.SI-ID 68989441] 2.

RUANO, António E., COLNARIČ, Matjaž, et al. Computational intelligence in control. *Annual Reviews in Control*, ISSN 1367-5788. [Print ed.], Available online 7 October 2014, vol. , iss. , str. 1-10, doi: 10.1016/j.arcontrol.2014.09.006. [COBISS.SI-ID 18142742]

KALOGERAS, Athanasios P., COLNARIČ, Matjaž, JOVAN, Vladimir, et al. *I3E transnational strategic research agenda : promoting innovation in the industrial informatics and embedded systems sectors through networking*. [S. l.: s. n., 2012]. 70 str., ilustr. http://www.i3e.eu/. [COBISS.SI-ID 16957462]

COLNARIČ, Matjaž. An example of fault detection and reconfiguration-based tolerance in distributed embedded control systems. V: Special International Conference on Complex systems: synergy of control communications and computing, September 16-20, 2011, Ohrid, Republic of Macedonia. KOLEMISHEVSKA-GUGULOVSKA, Tatjana (ur.), STANKOVSKI, Mile J. (ur.). *Proceedings of COSY 2011 papers : in honour of professor Georgi M. Dimirovski*. Skopje: Society for Electronics, Telecommunications, Automation, and Informatics of the Republic of Macedonia, 2011, str. 281-286. [COBISS.SI-ID 15385366]

COLNARIČ, Matjaž. Struggle for temporal predictability of processors for real-time environments, revisited 20 years after. V: UNGER, Herwig (ur.). *Autonomous systems : developments and trends*. (Studies in computational intelligence, ISSN 1860-949X, Vol. 391). Berlin; Heidelberg: Springer, cop. 2011, str. 3-12. [COBISS.SI-ID 15575830]