

## Lecturers

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**Name:** Blaž Pongračič

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**Name:** Tadej Visinski

**Academic Background:** Managerial Economics and Mechanical Engineering

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**Name:** Birgit Huetter

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**Name:** Christian Payerl

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**Name:** Tadej Stepišnik Perdih

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## Course Description

**Title:** Technology, take the wheel!

**Fields of activity:** Automotive Engineering, Computer Science/Automatic Control/Informatics, Control Engineering/Systems engineering, Transport Engineering

**Examination type:** Written exam

**Number of ECTS credits issued:** 1 ECTS

**Learning Goals and Objective:** The aim is that participants get to understand how autonomous car works, how advanced the technology already is and some moral dilemmas implemented in programming of such cars. With the knowledge provided, students can have a better understanding how future transportation will look like.

|                          |  |
|--------------------------|--|
| Name of activity         | <b>Introduction to autonomous cars</b>   |
| Number of working hours  | 2 hours  |
| Type of activity         | Lecture  |
| Lecturer                 | Nejc Jezeršek  |
| Short summary of content | <ul style="list-style-type: none"> <li>• Basic terms</li> <li>• Levels of autonomy</li> <li>• Examples of driver assistance systems</li> <li>• Legal aspects</li> </ul>  |
| Bibliography             | N/A  |
| Expected effect          | <p>We will make a short overview of finished European projects regarding autonomous driving and discuss the effects of human factor on autonomous vehicles.</p> <p>Participants will be confronted with Pros and Cons of autonomous driving and participate in debate regarding the legal questions related to driverless cars. To sum up, we will take a glimpse into open points and future of autonomous driving.</p> |

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|--------------------------|---|
| Name of activity         | <b>Basics to perceiving traffic participants and signalization</b>  |
| Number of working hours  | 2 hours   |
| Type of activity         | Lecture   |
| Lecturer                 | Jernej Klemenc  |
| Short summary of content | <ul style="list-style-type: none"> <li>• Sensorics and information-communication technologies</li> <li>• Radars, cameras, distance sensors, IR</li> <li>• Data processing - perceiving traffic signalization</li> <li>• Image recognition, artificial intelligence, data mining</li> <li>• Communication between participants in traffic</li> </ul> |
| Bibliography             | N/A   |
| Expected effect          | <p>Students will have the opportunity to see the problems of perceiving the rest of the participants in traffic and communication among them.</p>   |

|                          |  |
|--------------------------|--|
| Name of activity         | <b>Lecture on artificial sensing</b>   |
| Number of working hours  | 2 hours  |
| Type of activity         | Lecture  |
| Lecturer                 | Danijel Skočaj   |
| Short summary of content | <ul style="list-style-type: none"> <li>● Signal processing</li> <li>● Perceiving data around vehicles</li> <li>● Deep learning for road segmentation</li> <li>● Intelligent systems</li> </ul>                     |
| Bibliography             | N/A  |
| Expected effect          | Students will be introduced with the changes on the field of artificial sensing, which will make autonomous cars the reality in our future. The lecture will be focused on intelligent systems in a wider context. |

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|--------------------------|--|
| Name of activity         | <b>Autonomous vehicles in simulated environment lecture</b>  |
| Number of working hours  | 2.5 hours  |
| Type of activity         | Lecture  |
| Lecturer                 | Tomaž Čegovnik, Jaka Sodnik  |
| Short summary of content | <ul style="list-style-type: none"> <li>● Autonomous vehicles in simulated environment</li> <li>● Driver evaluation</li> <li>● Human factor</li> <li>● In-vehicle HCI</li> </ul>  |
| Bibliography             | N/A  |
| Expected effect          | Students will learn about the testing of autonomous vehicles in simulated environment, driver evaluation and in-vehicle HCI (human computer interaction). Lecture will show how the company Nervteh simulates driving and how the evaluate this data in post processing procedure. |

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|--------------------------|--|
| Name of activity         | <b>Company visit - Nervteh</b>   |
| Number of working hours  | 1.5 hours  |
| Type of activity         | Company visit  |
| Lecturer                 | Tomaž Čegovnik   |
| Short summary of content | <ul style="list-style-type: none"> <li>• Driving in a simulated environment</li> </ul>   |
| Bibliography             | N/A  |
| Expected effect          | Students will be introduced with Nervteh and will have the opportunity to test themselves in a simulated environment of driving a car. |

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|--------------------------|---|
| Name of activity         | <b>Lecture about Autonomous mobility as seen in European Commission</b>   |
| Number of working hours  | 2 hours   |
| Type of activity         | Lecture   |
| Lecturer                 | Blaž Pongračič  |
| Short summary of content | <ul style="list-style-type: none"> <li>• Strategy of European Commission for connected and autonomous mobility</li> <li>• Safety - ensuring road safety, data protection, access and cybersecurity</li> <li>• Society - anticipating the effects of cooperative, connected and automated mobility on society, economy and environment</li> <li>• Competitiveness - developing key technologies in Europe to keep up with competition and create jobs</li> </ul> |
| Bibliography             | <a href="https://ec.europa.eu/transport/modes/road/news/2018-05-17-europe-on-the-move-3_en">https://ec.europa.eu/transport/modes/road/news/2018-05-17-europe-on-the-move-3_en</a>   |
| Expected effect          | Participants will understand the complexity of the topic and the view of a regulatory institution (European Commission) on development of connected and autonomous mobility.  |

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|--------------------------|--|
| Name of activity         | <b>Workshop - miniature autonomous vehicles</b>  |
| Number of working hours  | 4 hours  |
| Type of activity         | Laboratory work  |
| Lecturer                 | Andrej Zdešar  |
| Short summary of content | <ul style="list-style-type: none"> <li>• Tackling problem of localization, path planning and path tracking</li> <li>• Introduction to the algorithms for planning</li> </ul>   |
| Bibliography             | N/A  |
| Expected effect          | <p>The participants of the workshop will tackle the problem of path tracking on a special cyber-physical model in a form of a small-scale city with miniature wheeled mobile robots. Each team will get their own wheeled mobile robot and will need to implement their own control algorithm for autonomous driving of the robot along the path.</p> <p>The workshop will provide basic insight into the emerging field of autonomous mobile systems.</p> |

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|--------------------------|---|
| Name of activity         | <b>Discussion about moral dilemmas of new technologies</b>  |
| Number of working hours  | 2 hours   |
| Type of activity         | Group seminar   |
| Lecturer                 | Matija Svetina  |
| Short summary of content | <ul style="list-style-type: none"> <li>• Moral dilemmas</li> <li>• Trolley problem</li> <li>• Ethics of arriving technologies</li> </ul>  |
| Bibliography             | N/A   |
| Expected effect          | <p>Participants will be introduced with psychological point of view on autonomous vehicles and other problems of new technologies. Group discussion about this will be held and students will try to find answers to psychological and philosophical questions about emerging technologies.</p> |

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|--------------------------|--|
| Name of activity         | <b>Vehicle ecosystem management — Company Kivi-com</b>   |
| Number of working hours  | 1 hour   |
| Type of activity         | Lecture  |
| Lecturer                 | Tadej Visinski   |
| Short summary of content | <ul style="list-style-type: none"> <li>• Ecosystem of vehicle data</li> <li>• Managing and processing vehicle data</li> <li>• Presentation of Optitech ecosystem</li> </ul>  |
| Bibliography             | <a href="https://www.kivi.si/en/solutions/OptiTech-connected-vehicle-platform">https://www.kivi.si/en/solutions/OptiTech-connected-vehicle-platform</a>  |
| Expected effect          | <p>The purpose of the lecture is to present the content part of the Opitech system and all the technological background of the ecosystem for managing and processing vehicle data as the company Kivi envisaged.</p> <p>Participants will learn how to capture data from the vehicle, what information can be obtained and what can be achieved by processing this data.</p> |

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|--------------------------|--|
| Name of activity         | <b>Lecture about autonomous boats</b>  |
| Number of working hours  | 1 hour   |
| Type of activity         | Lecture  |
| Lecturer                 | Matej Kristan  |
| Short summary of content | <ul style="list-style-type: none"> <li>• Alternatives to autonomous cars</li> <li>• Autonomous boats</li> <li>• Development of methods for computer vision for obstacle detection</li> </ul>                     |
| Bibliography             | N/A  |
| Expected effect          | <p>Students will have the opportunity to see some alternatives to autonomous cars, mostly autonomous boats. Students will upgrade their understanding in computer vision, which does not limit only to cars.</p> |



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|--------------------------|--|
| Name of activity         | <b>Lecture about development of autonomous cars - Company Magna Steyr</b>  |
| Number of working hours  | 2 hour   |
| Type of activity         | Lecture  |
| Lecturer                 | Birgit Huetter, Christian Payerl   |
| Short summary of content | <ul style="list-style-type: none"> <li>• Preview of company Magna Steyr and its departments</li> <li>• Development of autonomous cars</li> <li>• Advanced driver assistance systems</li> </ul>   |
| Bibliography             | N/A  |
| Expected effect          | Students will be introduced with the development of autonomous cars. Company Magna Steyr is developing numerous driver assistance systems which could potentially be implemented in future cars. |

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|--------------------------|--|
| Name of activity         | <b>Final Exam</b>  |
| Number of working hours  | 1 hour   |
| Type of activity         | Written exam   |
| Lecturer                 | Tadej Stepišnik Perdih   |
| Short summary of content | Students will have to answer to questions prepared by professors from the course. The questions will be from the content of working hours. |
| Expected effect          | Students will have the overview of new knowledge that they gained during the course.   |

# Pre-materials

Pre-materials are prepared by professors that will take part in our course. They contain basic knowledge that has to be ingested before the event. Thanks to pre-materials we will be able to skip really basic information and provide more advanced knowledge.

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|--------------------------|--|
| <b>Name</b>              | <a href="#">Python</a> , <a href="#">Ubuntu terminal commands</a>  |
| <b>Topic/field</b>       | Programming  |
| <b>Short description</b> | It is desired from students to know and understand programming sentences on a basic level, to know what python is and how to write simple expressions in Python 2.7. Some of really basic linux terminal commands should also be considered. |

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| <b>Name</b>              | <a href="#">Trolley problem</a>  |
| <b>Topic/field</b>       | Ethics   |
| <b>Short description</b> | It is desired from students to understand the basics to trolley problem and to transfer the idea to autonomous cars. |

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|--------------------------|---|
| <b>Name</b>              | <a href="#">Simulation</a> , <a href="#">HCI</a>  |
| <b>Topic/field</b>       | Simulator / simulation environment  |
| <b>Short description</b> | It is desired from students to be familiar with basic ideas behind simulation environment and its interaction with human. |

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|--------------------------|---|
| <b>Name</b>              | <a href="#">Advanced Driver Assistance Systems</a>  |
| <b>Topic/field</b>       | Simulator / simulation environment  |
| <b>Short description</b> | It is desired from students to be familiar with basics to driver assistance systems, what kind of advantages it brings and which data sources does it use in modern vehicles. |