

Syllabus – Future Mobility

General Course Details:

Kurs No.:	BAE 5028
Title:	Future mobility: from privately owned Vehicles (ICEVs) to decarbonised autonomous mobility on demand
Language:	German
Credits:	ECTS 3, 2 SWS
Level:	Advanced (Master)
Sessions:	Irregular, see current timetable for room and timing
Participants:	Master Students of the Engineering School
Requirements:	Students should have good technical and business knowledge and be open minded

Lectures Details:

Lecturer:	Prof. Dr. Guy Fournier
Office:	T1.3.29 or virtual roam: https://alfaview.com/join/alfaview-technik/0ed450ce-0ee5-42e0-bf4e-3b6949885264/c5d76600-880b-4988-a991-c09bcc321a14
Office hours:	Mon 13:45-15:15; individual appointments should be arranged per e-mail (see below)
E-Mail:	guy.fournier@hs-pforzheim.de (preferred communication)

Your education is important to me. Therefore, I would like to support you. Please feel free to contact me via email if you have any questions or problems regarding the course. I will respond as soon as possible and if necessary make an appointment with you.

Description of Course (tbc):

This course aims to advance the student's knowledge in future mobility. Mobility is a key element of our societies but is increasingly criticised because of the external costs it generates. The question is how could future mobility be more sustainable in terms of economic, social and environmental impact. Different new technologies and business models will thus be analysed and evaluated.

Main learning goals are to:

- to increase comprehension on how environment and in general external costs in transport like congestion costs, noise, accidents, climate change, air pollution, habitat damage or resource availability influence future mobility,
- to introduce future automotive technologies and mobility concepts and to evaluate them.
- to open student's mind and develop critical thinking skills.

The course is to be assigned to the "Technology" part of the elective courses.

Learning Objectives:

	Lernergebnis	Beitrag
2.1	Die Studierenden können Probleme erkennen und abgrenzen sowie deren Bedeutung einschätzen.	Erkenntnisse in der Problemstellung des Wandels des Antriebsstrangs hin zur Elektrifizierung und Einschätzung von Alternativen
2.2	Die Studierenden können komplexe betriebliche und überbetriebliche Probleme und Herausforderungen aus verschiedenen Perspektiven und/oder im internationalen Kontext analysieren.	Erwerb von Kenntnissen zu Technologien und Lösungen in der Elektromobilität und automatisierten Mobilität
2.4	Die Studierenden können Fachvertretern und Laien komplexe Probleme und Problemlösungen erfolgreich erläutern.	Überblick über Herausforderungen und technische Ansätze der Elektromobilität und automatisierten Elektromobilität
4.1	Die Studierenden verfügen über Expertenkenntnisse im technischen und wirtschaftlichen Bereich zur integrativen Lösung von komplexen Aufgabenstellungen.	Verständnis des Zusammenwirkens von Lösungsmöglichkeiten, neuen Services und wirtschaftlichen Bedingungen

Contents of the Course:

During a semester approximately 14 sessions are available to consider the following main topics:

- Drivers of the new mobility paradigm
- Options for the new individual mobility:
 - o Short-term strategies:
 - Aerodynamics,
 - Improved drive resistance,
 - Improved energy efficiency of car components (e.g. powersteering, air conditioning, alternator),
 - Light weight design,
 - Downsizing.
 - o Biofuel and synthetic fuels
 - o Hybrid vehicles
 - o Electric vehicles
- Electric vehicles:
 - o operating modes
 - o battery
- Automated vehicles:
 - o Operating modes and levels of automation,
 - o automated technologies:
 - Sense (perceive relevant static objects, determine the location of AV, predict the future behaviour of relevant actors) with sensors like GNSS, Radar, Camera, LiDAR, V2X)
 - Plan (create a collision free and lawful driving plan)

- Act (correctly execute and actuate the driving plan), micro- and macro navigation
 - Fields of application (truck, shuttle, car, train etc.)
 - Player/market
 - Legislation; Obstacles
- Mobility and services:
 - EV as a part of mobility solutions: Mobility as a service (Maas)
 - EV as a part of storage solutions: V2G, P2G
- Project and simulation reports:
 - EV and new mobility services and value-added services (V2G)
 - Car-sharing project in Baden-Württemberg
 - Robocabs simulation in Berlin and Stuttgart
 - Autonomous EV and public transportation: the “Avenue” project (Horizon 2020)
- Invited Guest: Martin Lischka, Head of Product Strategy & Product Management Pininfarina Automobili on tbd: E-Mobility and hypercars: the example of Pininfarina

Tentative schedule:

Session	Date	
1	19.04.2020 13:45 - 15:15	Drivers of the new mobility paradigm
2	19.04.2021 15:30 - 17:00	Options for the new individual mobility
3	10.05.2021 13:45 - 15:15	Options for the new individual mobility
4	10.05.2021 15:30 - 17:00	Electric vehicles: operating modes, battery
5	17.05.2021 13:45 - 15:15	Electric vehicles: operating modes, battery
6	17.05.2021 15:30 - 17:00	Automated vehicles: levels of automation, sense (perceive relevant static objects, determine the location of AV, predict the future behaviour of relevant actors)
7	7.06.2021 13:45 - 15:15	Automated vehicles: Plan (create a collision free and lawful driving plan); Act (correctly execute and actuate the driving plan)
8	7.06.2021 15:30 - 17:00	EV and new mobility services and value-added services: V2G, P2G
9	14.06.2021 13:45 - 15:15	E-Mobility and hypercars: the example of Pininfarina
10	14.06.2021	E-Mobility and hypercars: the example of Pininfarina

	15:30 - 17:00	
11	14.06.2021 17:15 - 18h45	E-Mobility and hypercars: the example of Pininfarina
12	21.06.2021 13:45 - 15:15	Project and simulation reports: EV and new mobility services and value-added services (V2G)
13	21.06.2021 15:30 - 17:00	Project and simulation reports: Car-sharing project in Baden-Württemberg
14	21.06.2021 17:15 - 18h45	Project and simulation reports: Autonomous EV and public transportation: the "Avenue" project (Horizon 2020)
15		

Didactical Approach and Workload:

The course consists of 6 sessions (see time table) and awards 3 credits for a successful completion of the course. It is therefore expected that student's workload will amount at least 90 hours to prepare themselves for the sessions, attend and revise the lectures.

The teaching and learning concept is characterised by a three-phase approach, whereby the understanding of interrelationships is clearly in the foreground in comparison to the mere provision of information. In phase I and thus the essential part of the course is taught by the lecturers in the form of a lecture of the relevant knowledge. Here, the students are introduced to the relevant knowledge through e.g. questions and discussions and are actively involved.

In Phase II, these knowledge modules are deepened and transferred to practical applications, usually immediately afterwards, through exercises or case studies to be worked on by the students themselves. The results are presented by the students and then discussed. This means that in the course the basic knowledge is not only conveyed but is also applied and deepened through application examples and exercises.

In phase III the students deepen the acquired knowledge once again independently based on the literature. Continuous collaboration and reworking of the material is therefore an indispensable prerequisite for learning success. At the same time the effort for the exam preparation is minimized and the time and effort for the whole exam preparation is semester. Active participation in teaching is an elementary component of the teaching and learning concept. The teacher is always available as a discussion partner and provides support and advice. The communication takes place in personal counselling or via e-mail.

My teaching philosophy:

I want to do my part to ensure that you achieve a successful learning progress and gain an understanding of sustainable mobility. I would like to create an interesting and varied lecture for you, which will pave the way for the world of work. Your comments which serve the learning progress of all are welcome. My goal is that you are successful in the lecture, but the majority of the work you must perform yourself.

Method of Assessment:

PLH/PLL/PLK/PLP/PLR : A written exam (60 min) or housework will be provided.

Students are expected to be present at all classes. Absences have to be excused in advance and agreed upon by the lecturer. Unexcused absence during more than two classes leads to failure of the entire course.

The grading is as follows:

- 1.0 Very good, a performance significantly above the average
- 2.0 Good, an above average performance
- 3.0 Satisfactory, an average performance
- 4.0 Adequate, a below average performance with noticeable shortcomings
- 5.0 Fail, an unacceptable performance

Literature:

To be provided in class