Course Handbook Automotive Engineering Master

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Deputy Head of Studies	Prof. Dr. Hans-Werner Groh
Chairman of Examination	Prof. Dr.-Ing. Jochen Gessat
Deputy Chairman of Examination	Prof. Dr. Jörg Hoffmann

Qualifikation Goals of Study Programme

Automotive Engineering Master - mandatory courses (overview)

Module name (EN)	Code	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
CAE and Modern Calculation Methods	FTM-CAE	1	3V+1U+1P	6	Prof. Dr. Frank Ulrich Rückert
Embedded Programming	FTM-HPRG	1	3V+1U+1P	6	Prof. Dr. Hans-Werner Groh
Virtual Vehicle Development	FTM-VFZG	1	3V+1U+1P	6	Prof. Dr. Hans-Werner Groh

(3 modules)

Automotive Engineering Master - optional courses (overview)

Module name (EN)	Code	Semester	Hours per semester week / Teaching method	ECTS	Module coordinator
Bionics in Automotive Engineering	FTM-BIO	1	2V	3	Prof. Dr.-Ing. Hans-Joachim Weber

Entrepreneurship in Engineering	FTM-ENT	1	3V	3	Prof. Dr. Jörg Hoffmann
Experiment Design and Quality Control	FTM-VUQ	-	2V	3	Prof. Dr. Gerald Kroisandt
Failure Analysis in Operational and Manufacturing Environments	FTM-SABF	-	1V	2	Prof. Dr. Moritz Habschied
Labor Law	FTM-ARBR	-	-	2	Prof. Dr. Ralf Oetinger
Traffic Control and Traffic Management	FTM-KVUV	2	4V	6	Prof. Dr. Horst Wieker

(6 modules)

Automotive Engineering Master - mandatory courses

CAE and Modern Calculation Methods

Module name (EN): CAE and Modern Calculation Methods
Degree programme: Automotive Engineering, Master, ASPO 01.04.2021
Module code: FTM-CAE
SAP-Submodule-No.: P242-0105
Hours per semester week / Teaching method: 3V+1U+1P (5 hours per week)
ECTS credits: 6
Semester: 1
Mandatory course: yes
Language of instruction: German

Assessment:

[*still undocumented*]

Applicability / Curricular relevance:
FTM-CAE (P242-0105) Automotive Engineering, Master, ASPO 01.04.2021, semester 1, mandatory course
FTM-CAE (P242-0105) Automotive Engineering, Master, ASPO 01.04.2023, semester 1, mandatory course

Workload:
75 class hours (= 56.25 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 123.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Frank Ulrich Rückert

Lecturer:
Prof. Dr. Jörg Hoffmann
Prof. Dr. Frank Ulrich Rückert

[*updated 31.05.2022*]

Learning outcomes:
After successfully completing this module, students will have acquired theoretical and practical knowledge about modern simulation methods for the advance planning of the system behavior, function, structure, life cycle and sustainability of vehicle systems and their components.
They will be able to understand and master the use and handling of powerful 1D/3D CAE systems, as well as 3D printing, in particular the properties of process media and materials. In addition, they will be able to perform couplings of strength, flow, and thermal simulations.

Based on finite element methods and finite volume methods, in combination with statistical design of experiments (DOE), students will be able to evaluate development parameters and develop vehicle systems and their components to specification.

[*updated 01.07.2021*]

Module content:
- Specific algorithms and procedures when working with 1D and 3D CAE systems
- Methods for the design and additive manufacturing of complex individual parts and assemblies, as well as for the creation of digital twins based on individual part and assembly drawings
- CAE tools: kinematic simulation, installation simulation, parametric design, manufacturing simulation, temperature simulation, vibration behavior using digital twins
- Overview of modern calculation methods of finite elements and the finite volume method
- Introduction to the setup of a more system-technical design tool (Simcenter Amesim)
- Introduction to a commercial CFD/FEM code (ANSYS Workbench)
- Practical 3D flow simulation and structural analysis with ANSYS Workbench

[*updated 01.07.2021*]

Teaching methods/Media:
Team building through learning team coaching (LTC) methods; seminar-style, interactive course based on blended learning. Installation of the CAE tools at home and use in the PC-pool to create the digital twin. Work in the hands-on learning workshops. Worksheets and video tutorials. Online meetings using MS Teams.

[*updated 01.07.2021*]

Recommended or required reading:
- Huei-Huang Lee: Finite Element Simulations with ANSYS Workbench 19; ISBN-13 978-1-63057-211-2
- Willi Bohl, Walter Wagner: Technische Strömungslehre; Vogel Verlag; ISBN 3-8023-0576-0
- Rolf Steinbuch: Finite Elemente Ein Einstieg; ISBN 3-540-63128-3
- Yunus A. Cengel, Afshin J. Ghajar: Heat and Mass Transfer Fundamentals & Applications; ISBN-13: 978-93-392-2319-9
- Berthold Noll; Numerische Strömungsmechanik Grundlagen; Springer Verlag; ISBN 3-540-56712-7
- Christof Gebhardt: Praxisbuch FEM mit ANSYS Workbench Einführung in die lineare und nichtlineare Mechanik; ISBN 978-3-446-42517-0
- Florian Kramer: Integrale Sicherheit von Kraftfahrzeugen; Springer Verlag; ISBN 978-3-8348-2608-4
- Qasim Shah: LS-DYNA für Einsteiger; AV Akademikverlag; ISBN 978-620-2-22602-8

[*updated 01.07.2021*]

Embedded Programming

Module name (EN): Embedded Programming

Degree programme: Automotive Engineering, Master, ASPO 01.04.2021

Module code: FTM-HPRG

SAP-Submodule-No.: P242-0108, P242-0109

Hours per semester week / Teaching method: 3V+1U+1P (5 hours per week)

ECTS credits: 6

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Programming exercises as written exam (120 min)

[*updated 25.05.2021*]

Applicability / Curricular relevance:
FTM-HPRG (P242-0108, P242-0109) Automotive Engineering, Master, ASPO 01.04.2021, semester 1, mandatory course
FTM-HPRG (P242-0108, P242-0109) Automotive Engineering, Master, ASPO 01.04.2023, semester 1, mandatory course

Workload:
75 class hours (= 56.25 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 123.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:
FTM-PAEF

[*updated 31.05.2022*]

Module coordinator:
Prof. Dr. Hans-Werner Groh

Lecturer:
Prof. Dr. Hans-Werner Groh

[*updated 31.05.2022*]

Learning outcomes:
After successfully completing this module, students will understand how microcontrollers operate and will thus, be able to integrate them into control and regulation processes.

They will be able to independently learn specific functions of unknown microcontrollers by working with the corresponding data sheets.
- They will have mastered the C programming language to create algorithms and thus, be able to solve existing technical problems when using microcontrollers.

- Students will be able to abstract practical problems to the point where they can replicate real-world problems on emulators.

- They will be able to program microcontrollers quickly and efficiently using graphical interfaces.

- How microcontrollers work, especially I/O, registers, and interfaces. Using processor data sheets to initialize controller functions.

[*updated 25.05.2021*]

Module content:

- Advanced knowledge of the programming language C, especially control structures, functions, pointers and declarations.

- How a compiler works and how compiler results are represented in Assembler code.
- Special hardware-specific programming methods and requirements such as fixed-point arithmetic, code efficiency, offloading to hardware functions, interrupt control and fail safety.
- Methods for meeting real-time requirements such as interrupt handling of fast external events, programming time-deterministic routines such as controllers, filters.

- Ways to integrate microcontroller hardware into an engineering process:
Signal conditioning for sensors, controlling actuators (power electronics), and recording and displaying process variables.
Based on this, the use of C-programmed algorithms for processing various I/O signals.

- Ways to automatically generate code from Matlab/Simulink for Dspace and Arduino hardware to create control systems.
- Purpose and systematics of hardware-in-the-loop simulations.
Creating emulators for use in a HiL environment.
- Applying what was learned in a larger project at the end of the semester in preparation for a practical exam.

[*updated 25.05.2021*]

Teaching methods/Media:
- Lecture with corresponding programming exercises
- Term paper as final project

[*updated 25.05.2021*]

Recommended or required reading:
- Data sheets for the processors and evaluation boards used (Arduino)
- User manuals of the HiL systems used (dSPACE)

[*updated 25.05.2021*]

Virtual Vehicle Development

Module name (EN): Virtual Vehicle Development

Degree programme: Automotive Engineering, Master, ASPO 01.04.2021

Module code: FTM-VFZG

SAP-Submodule-No.: P242-0117, P242-0118

Hours per semester week / Teaching method: 3V+1U+1P (5 hours per week)

ECTS credits: 6

Semester: 1

Mandatory course: yes

Language of instruction:
German

Assessment:
Written exam (90 minutes)

[*updated 25.05.2021*]

Applicability / Curricular relevance:
FTM-VFZG (P242-0117, P242-0118) Automotive Engineering, Master, ASPO 01.04.2021, semester 1, mandatory course
FTM-VFZG (P242-0117, P242-0118) Automotive Engineering, Master, ASPO 01.04.2023, semester 1, mandatory course

Workload:
75 class hours (= 56.25 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 123.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Hans-Werner Groh

Lecturer:
Prof. Dr. Hans-Werner Groh (lecture/exercise)
Prof. Dr.-Ing. Rüdiger Tiemann (lecture/exercise)
M.Eng. Michael Fries (lecture/exercise)

[*updated 07.04.2021*]

Learning outcomes:
H.-W. Groh: Bildverarbeitung (1 V + 1 U/P)
After successfully completing this part of the module, students will be able to read out images from files, from video files, or from a camera, display them on the screen, and post-process them (e.g., convert them) as required.

M. Fries / TH. Heinze: GT-Power (1 V + 0,5 U/P)
After successfully completing this part of the module, students will be able to simulate the catalysts of internal combustion engines in terms of their flow behavior and pollutant conversion.

R. Tiemann: Einführung in die Mehrkörper-Simulation (MKS) am Beispiel des Automobils (1 V + 0,5 U/P)
Today´s automotive development is characterized by the use of many calculation and simulation software tools. After sucessfully completing this part of the module, students will be familiar with the existing systems and how they work.
- Simulation methods
- Multibody simulation (MBS); contents, performance, limitations, providers.
- Designing vehicle models, use of control systems for longitudinal and lateral dynamics, e.g. ABS, TCS, ESC
- Virtual test drives

[*updated 25.05.2021*]

Module content:
H.-W. Groh: Bildverarbeitung (1 V + 1 U/P)
- Introduction to the C++ programming language
- Introduction to the programming environment Qt + OpenCV
- Examples and your own programs for reading, analyzing and editing image files

M. Fries / TH. Heinze: GT-Power (1 V + 0,5 U/P)
- Creating the flow components and the catalyst block (monolith)
- Defining catalytic properties: surface (washcoat), loading (precious metals)
- Applying surface reactions
- Calibrating the model by means of experimental data

R. Tiemann: Einführung in die Mehrkörper-Simulation (MKS) am Beispiel des Automobils (1 V + 0,5 U/P)
- Methods for simulating mechanical systems
- Setup of simulations with rigid multibodies (MBS)
- Identifying the performance and limitations of MBS
- SiL, MiL, HiL, ViL terms
- Introduction to the CarMaker software from IPG Automotive
- Structure of (partial) vehicle models
- Virtual test maneuver trials

[*updated 25.05.2021*]

Teaching methods/Media:
H.-W. Groh: Bildverarbeitung (1 V + 1 U/P)
Lecture with practical exercises on the PC

M. Fries / TH. Heinze: GT-Power (1 V + 0,5 U/P)
Lecture with practical exercises on the PC

R. Tiemann: Einführung in die Mehrkörper-Simulation (MKS) am Beispiel des Automobils (1 V + 0,5 U/P)
Lecture mit projector (video), practical exercises using the CarMaker (IPG) software, as well as demonstrations by IPG Automotive

[*updated 25.05.2021*]

Recommended or required reading:
H.-W. Groh: Bildverarbeitung
- Ulrich Breymann: Der C++-Programmierer, 4., überarbeitete und erweiterte Auflage, Carl Hanser Verlag München 2015, Print-ISBN: 978-3-446-44346-4, E-Book-ISBN: 978-3-446-44404-1

M. Fries / TH. Heinze: GT-Power
- GT-Power manuals and tutorials

R. Tiemann: Einführung in die Mehrkörper-Simulation (MKS) am Beispiel des Automobils
- Adamski, D., Simulation in der Fahrwerktechnik, Springer Vieweg;
- IPG documents,
- Course materials,
- Rill, G., Schaeffer, T., Grundlagen und Methodik der Mehrkörpersimulation
- Shabana, A., Einführung in die Mehrkörpersimulation

[*updated 25.05.2021*]

Automotive Engineering Master - optional courses

Bionics in Automotive Engineering

Module name (EN): Bionics in Automotive Engineering

Degree programme: Automotive Engineering, Master, ASPO 01.04.2021

Module code: FTM-BIO

SAP-Submodule-No.: P242-0101

Hours per semester week / Teaching method: 2V (2 hours per week)

ECTS credits: 3

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam, term paper

[*updated 25.05.2021*]

Applicability / Curricular relevance:
FTM-BIO (P242-0101) Automotive Engineering, Master, ASPO 01.04.2021, semester 1, optional course
FTM-BIO (P242-0101) Automotive Engineering, Master, ASPO 01.04.2023, semester 1, optional course

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr.-Ing. Hans-Joachim Weber

Lecturer:
Prof. Dr.-Ing. Hans-Joachim Weber

[*updated 20.04.2021*]

Learning outcomes:
After successfully completing this module, students will have an overview of what bionics can do. They will be able to identify analogies between nature and technology and learn ways to implement and apply them in simple cases. Students will be familiar with the possibilities of bionic design optimization and will be able to apply them to simple cases.

[*updated 25.05.2021*]

Module content:
Insight into bionics, history of bionics
Construction bionics: Materials, composites, bonding, targeted adhesion and release, locomotion (walking, robotics, in water and air), nanobionics, process bionics, information bionics.
Organizational bionics, evolutionary bionics
Design optimization
The search for bionic solutions

[*updated 25.05.2021*]

Recommended or required reading:
W. Nachtigall - Das große Buch der Bionik;
Mattheck - Die Körpersprache der Bauteile;
J. Zrzavý, D. Storch S., Mihulka - Evolution

[*updated 25.05.2021*]

Entrepreneurship in Engineering

Module name (EN): Entrepreneurship in Engineering

Degree programme: Automotive Engineering, Master, ASPO 01.04.2021

Module code: FTM-ENT

SAP-Submodule-No.: P242-0102

Hours per semester week / Teaching method: 3V (3 hours per week)

ECTS credits: 3

Semester: 1

Mandatory course: no

Language of instruction:
German

Assessment:
Project with final presentation

[*updated 25.05.2021*]

Applicability / Curricular relevance:
FTM-ENT (P242-0102) Automotive Engineering, Master, ASPO 01.04.2021, semester 1, optional course
FTM-ENT (P242-0102) Automotive Engineering, Master, ASPO 01.04.2023, semester 1, optional course

Workload:
45 class hours (= 33.75 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 56.25 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Jörg Hoffmann

Lecturer: Prof. Dr. Jörg Hoffmann

[*updated 16.04.2021*]

Learning outcomes:
After successfully completing this module, students will be familiar with the challenges connected to a problem-oriented development approach and will be able to analyze and evaluate them.
They will be able to evaluate and derive an economic enterprise from this approach.
In addition, they will be familiar with modern alternative development approaches, such as the Design Thinking Process or the Blue Ocean Strategy, and will be able to merge these with the problem-oriented development approach.
They will be able to create practice-oriented pitch decks and business plans.

Students will have a general overview of the basics of business administration and project management, as well as various tools for entrepreneurship in engineering, and will be able to assess and apply their areas of application and potential.

[*updated 25.05.2021*]

Module content:
Innovation management (Innovation strategies, impulses for innovations, innovation processes)
Generating ideas/concepts according to the principle of Design Thinking/ Design Sprint process, basics of Systematic Incentive Thinking (SIT) and the Ikigai concept, insight into the problem-oriented development approach in engineering.
Market and competitor analysis

Developing a cost model (design to cost)
Developing a business model
Principles of the institutional role model (economic and technical roles)
Corporate financing
Types of and the significance of entrepreneurship
Principles of starting a business
Establishing and expanding a company
Basics of personnel management and leadership
Basics for the development of marketing and sales strategies
Market entry, marketing and positioning
Company exit
Conducting lessons learned sessions

[*updated 25.05.2021*]

Teaching methods/Media:
Lecture with labs and workshops

[*updated 25.05.2021*]

Recommended or required reading:
Alexander Osterwalder, Yves Pigneur et al.: Business Model Generation: Ein Handbuch für Visionäre, Spielveränderer und Herausforderer
Vanja, S. (2019), CAx für Ingenieure: Eine praxisbezogene Einführung
Michael Lewrick, Patrick Link, Larry Leifer et al.: Das Design Thinking Playbook: Mit traditionellen, aktuellen und zukünftigen Erfolgsfaktoren
Hauschildt, J., Salomo, S., Schultz, C., & Kock, A. (2016). Innovationsmanagement. Vahlen.
Vahs, D., & Brem, A. (2013). Innovationsmanagement: Von der Idee zur erfolgreichen Vermarktung (4. Ausg.). Stuttgart: Schäffer-Poeschel Verlag.
Eversheim, W., Schuh, G., Integrierte Produkt- und Prozessgestaltung

[*updated 25.05.2021*]

Experiment Design and Quality Control

Module name (EN): Experiment Design and Quality Control

Degree programme: Automotive Engineering, Master, ASPO 01.04.2021

Module code: FTM-VUQ

Hours per semester week / Teaching method: 2V (2 hours per week)

ECTS credits: 3

Semester: according to optional course list

Mandatory course: no

Language of instruction:
German

Assessment:
Composition

[*updated 04.11.2020*]

Applicability / Curricular relevance:
FTM-VUQ Automotive Engineering, Master, ASPO 01.04.2021, optional course, technical
FTM-VUQ Automotive Engineering, Master, ASPO 01.04.2023, optional course, technical
MAM.2.1.2.29 (P241-0367) Engineering and Management, Master, ASPO 01.10.2019, optional course, technical

Workload:
30 class hours (= 22.5 clock hours) over a 15-week period.
The total student study time is 90 hours (equivalent to 3 ECTS credits).
There are therefore 67.5 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
FTM-MATH

[*updated 08.02.2022*]

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Gerald Kroisandt

Lecturer: Prof. Dr. Gerald Kroisandt

[*updated 23.03.2020*]

Learning outcomes:
After successfully completing this module and based on the statistical knowledge they acquired in MAM_19_A_1.01.MTS, students will be able to determine confidence intervals for a wide range of mean values and variances. They will also understand how process control charts work.
Students will understand tests, and in particular how to proceed when choosing a hypothesis and an alternative.

As with confidence intervals, they will be able to design appropriate tests for a wide range of situations. If something depends on several factors, e.g. the load capacity of a component, students will be familiar

with common methods for designing experiments and will be able to apply them.

The question as to which factor(s) produce differences in quality is examined by analysis of variance, which students will also be able to apply.

- Point estimator (ML estimator) and mean-squared error for quality assessment

[*updated 04.11.2020*]

Module content:

- Confidence intervals for diverse situtaions
- Basics of process control charts
- Hypothesis testing for different situations
- Designing experiments
- Analysis of variance

[*updated 04.11.2020*]

Recommended or required reading:

[*still undocumented*]

Failure Analysis in Operational and Manufacturing Environments

Module name (EN): Failure Analysis in Operational and Manufacturing Environments

Degree programme: Automotive Engineering, Master, ASPO 01.04.2021

Module code: FTM-SABF

SAP-Submodule-No.: P241-0363

Hours per semester week / Teaching method: 1V (1 hour per week)

ECTS credits: 2

Semester: according to optional course list

Mandatory course: no

Language of instruction:
German

Assessment:
Term paper

[*updated 01.10.2020*]

Applicability / Curricular relevance:
FTM-SABF (P241-0363) Automotive Engineering, Master, ASPO 01.04.2021, optional course, engineering
FTM-SABF (P241-0363) Automotive Engineering, Master, ASPO 01.04.2023, optional course, engineering
MTM.SBF Mechatronics, Master, ASPO 01.04.2020, optional course
MAM.2.1.2.15 (P241-0363) Engineering and Management, Master, ASPO 01.10.2013, semester 1, optional course
MST.SBF Mechatronics and Sensor Technology, Master, ASPO 01.04.2016, optional course
MST.SBF Mechatronics and Sensor Technology, Master, ASPO 01.10.2011, optional course

Workload:
15 class hours (= 11.25 clock hours) over a 15-week period.
The total student study time is 60 hours (equivalent to 2 ECTS credits).
There are therefore 48.75 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Moritz Habschied

Lecturer: Prof. Dr. Moritz Habschied

[*updated 20.04.2021*]

Learning outcomes:
After successfully completing this course, students will be able to use their knowledge about damage mechanisms to:
- apply the guidelines and procedures for clarifying faults and material-related manufacturing difficulties
- define the procedure for the analysis and modify it based on interim results.

- select the procedures to be applied and anticipate possible results.

- interpret the results in the context of relevant literature, the circumstances and research results.

- determine the primary cause of faults.

- giveing advice on how to avoid faults.

[*updated 01.10.2020*]

Module content:
- Systematic approach according to relevant literature and VDI guidelines
- Mechanical material testing
- Metallography
- REM and EDX analysis
- X-ray diffraction
- Material databases
- Discussion about the students´ results and reports

[*updated 01.10.2020*]

Teaching methods/Media:
Interactive lecture

[*updated 01.10.2020*]

Recommended or required reading:
Broichhausen, Schadenskunde
VdEh, Erscheinungsformen von Rissen und Brüchen
Lecture notes
K.-H. Schmitt-Thomas, Schadensanalytik
VDI-Richtlinie 3822

[*updated 01.10.2020*]

Labor Law

Module name (EN): Labor Law

Degree programme: Automotive Engineering, Master, ASPO 01.04.2021

Module code: FTM-ARBR

Hours per semester week / Teaching method: -

ECTS credits: 2

Semester: according to optional course list

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam

[*updated 23.11.2020*]

Applicability / Curricular relevance:
FTM-ARBR Automotive Engineering, Master, ASPO 01.04.2021, optional course, management
MAM_19_2.2.24 (P241-0373) Engineering and Management, Master, ASPO 01.10.2019, optional course, management

Workload:
The total student study time for this course is 60 hours.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Ralf Oetinger

Lecturer: Prof. Dr. Ralf Oetinger

[*updated 25.04.2022*]

Learning outcomes:

[*still undocumented*]

Module content:

[*still undocumented*]

Recommended or required reading:

[*still undocumented*]

Traffic Control and Traffic Management

Module name (EN): Traffic Control and Traffic Management

Degree programme: Automotive Engineering, Master, ASPO 01.04.2021

Module code: FTM-KVUV

Hours per semester week / Teaching method: 4V (4 hours per week)

ECTS credits: 6

Semester: 2

Mandatory course: no

Language of instruction:
German

Assessment:
Written exam

[*updated 26.02.2018*]

Applicability / Curricular relevance:
E2936 (P222-0097) Electrical Engineering and Information Technology, Master, ASPO 01.04.2019, semester 2, optional course, technical
FTM-KVUV Automotive Engineering, Master, ASPO 01.04.2021, semester 2, optional course
FTM-KVUV Automotive Engineering, Master, ASPO 01.04.2023, semester 2, optional course
KI833 (P222-0097) Computer Science and Communication Systems, Master, ASPO 01.04.2016, semester 2, optional course, telecommunications-specific
KIM-VSVM (P222-0097) Computer Science and Communication Systems, Master, ASPO 01.10.2017, semester 2, optional course, telecommunications-specific
MAM.2.1.4.10 (P222-0097) Engineering and Management, Master, ASPO 01.10.2013, semester 2, optional course, technical
PIM-WI77 Applied Informatics, Master, ASPO 01.10.2011, semester 2, optional course, informatics specific
PIM-VSVM (P222-0097) Applied Informatics, Master, ASPO 01.10.2017, semester 2, optional course, informatics specific

Workload:
60 class hours (= 45 clock hours) over a 15-week period.
The total student study time is 180 hours (equivalent to 6 ECTS credits).
There are therefore 135 hours available for class preparation and follow-up work and exam preparation.

Recommended prerequisites (modules):
None.

Recommended as prerequisite for:

Module coordinator:
Prof. Dr. Horst Wieker

Lecturer: Prof. Dr. Horst Wieker

[*updated 01.10.2021*]

Learning outcomes:
After successfully completing this module, students will be able to correctly classify traffic control and traffic management methods and procedures.

They will be able to describe the requirements and challenges of traffic control from an operational point of view.

Students will be able to apply the traffic flow theory to traffic control procedures. In doing so, they will be able to evaluate urban traffic disturbances and highway traffic control correctly in order to be able to make recommendations for control procedures. Students will also be able to take the operational view of traffic into account.

In addition, students will be capable of applying methodological approaches and explaining the data standards used.

Students will be able to describe the technical requirements of cooperative systems (Car2X) on the infrastructure and be able to assign them to vehicle-related applications.

The goal of this module is to enable students to analyze future development trends in traffic management and assess their effects.

[*updated 26.02.2018*]

Module content:
1. Definition of traffic management and traffic control and the differentiation between urban and suburban areas
2. Extra-urban traffic control systems
3. Urban traffic control systems
4. Traffic management
5. Extra-urban data standards
6. Urban data standards
7. Planning process and planning tools
8. Integrated traffic management, strategy management
9. Telematics, vehicle-related applications
10. Infrastructure quality in Germany
11. Infrastructure quality ROW and in particular, USA
12. Car2X and Car2Car, application overview
13. Car2X demands on traffic infrastructure
14. Intermodal traffic management
15. Outlook/Development trends in traffic management and control

[*updated 26.02.2018*]

Recommended or required reading:

[*still undocumented*]