Business, Technology & Development of Passenger Car Tires

Institut für Dynamik und Schwingungen

The course offers an introduction into automotive lighting technology and teaches the technological and physiological fundamentals which are necessary to understand and evaluate lighting systems. In addition to the required data available in the area of the art, the course focuses on the modern use of light sources. For example, light sources are used in automotive lighting, e.g. Volkswagen AG in Wolfsburg, Hella or the L-LAB in Lippstadt. The course consists of three parts: 1) a series of 6 introductive lectures as well as a practical training in light measurement and further investigations, 2) an introduction to automotive lighting technology, 3) an introduction to further optical systems will be considered. One main aspect of the lecture focuses on light-based driver assistance systems (e.g. glare-free high beam, marking light) which are one core aspect of today's technological development. Physiological and psychological basics like the structure of the human eye and the visual sense complete the course.

Engineering Dynamics and Vibration

Institut für Dynamik und Schwingungen

The course language is English.

Automotive Lighting

Automotive Lighting

The course offers an introduction into automotive lighting technology and teaches the technological and physiological fundamentals which are necessary to understand and evaluate lighting systems. In addition to the required data available in the area of the art, the course focuses on the modern use of light sources. For example, light sources are used in automotive lighting, e.g. Volkswagen AG in Wolfsburg, Hella or the L-LAB in Lippstadt. The course consists of three parts: 1) a series of 6 introductive lectures as well as a practical training in light measurement and further investigations, 2) an introduction to automotive lighting technology, 3) an introduction to further optical systems will be considered. One main aspect of the lecture focuses on light-based driver assistance systems (e.g. glare-free high beam, marking light) which are one core aspect of today's technological development. Physiological and psychological basics like the structure of the human eye and the visual sense complete the course.

Finite Elements I

Finite Elements I

The course offers an introduction into automotive lighting technology and teaches the technological and physiological fundamentals which are necessary to understand and evaluate lighting systems. In addition to the required data available in the area of the art, the course focuses on the modern use of light sources. For example, light sources are used in automotive lighting, e.g. Volkswagen AG in Wolfsburg, Hella or the L-LAB in Lippstadt. The course consists of three parts: 1) a series of 6 introductive lectures as well as a practical training in light measurement and further investigations, 2) an introduction to automotive lighting technology, 3) an introduction to further optical systems will be considered. One main aspect of the lecture focuses on light-based driver assistance systems (e.g. glare-free high beam, marking light) which are one core aspect of today's technological development. Physiological and psychological basics like the structure of the human eye and the visual sense complete the course.

Finite Elements II

Finite Elements II

The course offers an introduction into automotive lighting technology and teaches the technological and physiological fundamentals which are necessary to understand and evaluate lighting systems. In addition to the required data available in the area of the art, the course focuses on the modern use of light sources. For example, light sources are used in automotive lighting, e.g. Volkswagen AG in Wolfsburg, Hella or the L-LAB in Lippstadt. The course consists of three parts: 1) a series of 6 introductive lectures as well as a practical training in light measurement and further investigations, 2) an introduction to automotive lighting technology, 3) an introduction to further optical systems will be considered. One main aspect of the lecture focuses on light-based driver assistance systems (e.g. glare-free high beam, marking light) which are one core aspect of today's technological development. Physiological and psychological basics like the structure of the human eye and the visual sense complete the course.

Continuum Mechanics I

Continuum Mechanics I

The course offers an introduction into automotive lighting technology and teaches the technological and physiological fundamentals which are necessary to understand and evaluate lighting systems. In addition to the required data available in the area of the art, the course focuses on the modern use of light sources. For example, light sources are used in automotive lighting, e.g. Volkswagen AG in Wolfsburg, Hella or the L-LAB in Lippstadt. The course consists of three parts: 1) a series of 6 introductive lectures as well as a practical training in light measurement and further investigations, 2) an introduction to automotive lighting technology, 3) an introduction to further optical systems will be considered. One main aspect of the lecture focuses on light-based driver assistance systems (e.g. glare-free high beam, marking light) which are one core aspect of today's technological development. Physiological and psychological basics like the structure of the human eye and the visual sense complete the course.

Continuum Mechanics II

Continuum Mechanics II

The course offers an introduction into automotive lighting technology and teaches the technological and physiological fundamentals which are necessary to understand and evaluate lighting systems. In addition to the required data available in the area of the art, the course focuses on the modern use of light sources. For example, light sources are used in automotive lighting, e.g. Volkswagen AG in Wolfsburg, Hella or the L-LAB in Lippstadt. The course consists of three parts: 1) a series of 6 introductive lectures as well as a practical training in light measurement and further investigations, 2) an introduction to automotive lighting technology, 3) an introduction to further optical systems will be considered. One main aspect of the lecture focuses on light-based driver assistance systems (e.g. glare-free high beam, marking light) which are one core aspect of today's technological development. Physiological and psychological basics like the structure of the human eye and the visual sense complete the course.

English Courses, Faculty of Mechanical Engineering, Leibniz University Hannover, Date: 23.03.2018
Applied elasticity theory in the aviation

Applied elasticity theory in the aviation

Mechanics of Advanced Materials

Mechanics of Advanced Materials

Scientific Research Work:

Scientific Research Work:

Designing and simulation of optoelectronical systems

Designing and simulation of optoelectronical systems

Combustion Technology

Combustion Technology

Advanced Thermodynamics / Thermolab

Advanced Thermodynamics / Thermolab

Laser Material Processing

Laser Material Processing

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Institut für Kältetechnik und Thermotechnik

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Institut für Kältetechnik und Thermotechnik

Institut für Kältetechnik und Thermotechnik
- The students learn what a human-friendly robot is like.
- The students have sound knowledge of the theoretical foundations of human-friendly manipulation.
- The students know the fundamentals of recent methods for global planning in dynamic environments.

**Institution for Robotics**

Robotics I
- A Mathematical Introduction to Robotics Manipulation; R. Merlet, Spring; An Introduction to Robotics: Mechanics and Control; J.-J. Craig, Mechanical Engineering.

**Hands on experimentation with data mining tools and algorithms through research papers and scientific tools.**

- We will have different hands-on for the different tasks covered in the lectures: data mining in databases.
- The lectures are given in English.

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**Data Mining I**

Data Mining II
- The students know the foundations of robot control for human-robot interaction.
- The students have an overview of state-of-the-art reactive motion generation in dynamic environments.

**Institution for Statistics**

Probability Theory
- Basic concepts in data mining/ machine learning, Programming knowledge
- We will use different hands-on for the different data mining tools covered in the lectures: data mining in databases.
- Hands-on experimentation with data mining tools and algorithms through research papers and scientific tools.

**Institution for Computing**

Computing Systems
- The course deals with modern directions of computer science history and development, such as history and evaluation of operating systems, events processing and threads control, dependency and the present state of relational and object-oriented databases, concurrent programming and client-server interaction, distributed and collaborative multi-agency systems, virtual team-work games – soccer, basketball and so on. Distributed computing systems, virtual reality and artificial intelligence.
- The project and an examination.

**Institution for Distributed Computing**

Distributed Computing
- The course deals with modern directions of computer science history and development, such as: history and evaluation of operating systems, events processing and threads control, dependency and the present state of relational and object-oriented databases, concurrent programming and client-server interaction, distributed and collaborative multi-agency systems, virtual team-work games – soccer, basketball and so on. Distributed computing systems, virtual reality and artificial intelligence.
- The project and an examination.

**Institution for Networks**

Networks
- The course deals with modern directions of computer science history and development, such as: history and evaluation of operating systems, events processing and threads control, dependency and the present state of relational and object-oriented databases, concurrent programming and client-server interaction, distributed and collaborative multi-agency systems, virtual team-work games – soccer, basketball and so on. Distributed computing systems, virtual reality and artificial intelligence.
- The project and an examination.
The Assessment is done by a course project and a final examination.

The objective of this course is to study the base aspects in the fields of modern computer science, computational intelligence, software and hardware of intelligent systems. During this course students will learn main technologies, approaches and methods of computational intelligence, learn modern aspects of computational intelligence, and implement necessary concepts and methods for solving various types of tasks. Modern intelligent systems, fuzzy logic, production, adaptive resonance theory, expert systems, Artificial Intelligence systems, fuzzy computing, neuron networks, logic-based optimization, and approximate reasoning methods in software and hardware of intellectual systems.

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Neuroinformatics and Neurotechnologies

University of Science and Technology

The objective of the course is to provide an introduction to basic computational paradigms of artificial intelligence and brain-like computing intelligence for a large class of intellectual ill-formalising tasks solution; to develop an understanding of a new artificial neural networks paradigm; to gain experience of the main requirement for the employment of nanotechnology in various areas.

Micro- and Nanosystems

Institute for Microelectronics

The course covers fundamentals of analysis and modeling of the interaction of physical laws and the behavior of materials at the nanoscale and the influence of the environment on these processes. The students are expected to develop a comprehensive understanding of the principles of nanotechnology and the ability to apply these principles to real-world problems.

Numerical Implementation of Constitutive Models

Institute for Numerical Simulation

The course aims to provide a comprehensive understanding of the use of finite element methods in the analysis and design of engineering systems. Students will learn the basics of finite element analysis, including the formulation of the governing equations, the discretization process, and the solution of the resulting linear systems. The course will also cover advanced topics such as adaptive mesh refinement and parallel computing.

Performance Analysis II: Manufacturing Systems Modeling and Analysis

Institute for Systems Analysis

The course focuses on the analysis of manufacturing systems by using discrete-event simulation techniques. The main topics include the modeling of manufacturing systems, the selection of appropriate simulation models, and the generation of simulation results. The course will also cover practical applications of simulation techniques to real-world manufacturing systems.

Performance Analysis: Statics Models in Production and Logistics

Institute for Systems Analysis

The course covers fundamental models to analyze static systems and processes. The focus is on Markov models of manufacturing and service systems in both discrete and continuous time that are treated asymptotically, in particular when the parameters of the system grow large. The course will also cover the basic elements of the branch-and-bound method of solution.

Software Development Technology

Institute for Systems Analysis

The course develops skills in the object-oriented approach to programming on the basis of modern library usage in Fortran. The main topics include the design and implementation of object-oriented systems, the use of modern libraries, and the use of modern tools such as Visual Studio.

Scientific and Research Work

Institute for Scientific and Technical Work

The scientific and research work enables each student to practice research techniques, literature review, academic discussion, scientific writing and analysis of experimental data. After completion of the course, each student becomes familiar with a scientometric research theme and assumes responsibility for a scientific project. The project is completed under guidance, with the student documenting the results in written form, giving a presentation and feeding back discussion on the subject.

Bioinformatics and Bioinformatics

Institute for Bioinformatics

The main objective of this course is to study fundamental concepts and new developments in bioinformatics and biomedical fields. The course provides an introduction to the use of computer techniques for both biological and medical research.

Modern Problems of Computers and Information Science

Institute for Information Technologies

The course is designed to provide an understanding of the latest research in information technologies and their applications. The main topics include computer architectures, operating systems, computer networks, and software engineering.

Networks and Information

Institute for Networks and Information

The course covers the fundamentals of computer networks, including network models, protocols, and applications. The main topics include network topology, packet-switching, routing, and congestion control.

Neuroinformatics and Neurotechnologies

Institute for Neuroinformatics

The course is designed to provide an understanding of the latest research in neuroinformatics and their applications. The main topics include the modeling of neural systems, the analysis of neural data, and the development of new methods for understanding the brain.
The module teaches the derivation of primary energy to electrical energy. The successful candidate will be able to determine and to predict the energy conversion processes in the power plant operation. It covers the conversion of thermal energy into mechanical energy, and further, the process of mechanical energy into electrical energy. The operation principles of power plants, the energy conversion processes, and the energy system will be covered in detail. The module focuses on the operation principles and the energy conversion processes of thermal power plants. The students will get an overview of the different energy conversion processes and the essential components of thermal power plants.

Module Content:
- Introduction to power plant operation
- Operation principles of power plants
- Energy conversion processes
- Essential components of power plants
- Energy system and operation principles
- Case studies of different power plants

Module Assessment:
- Written examination
- Project work
- Participation in lectures and tutorials

Module Literature:
- R. Cierniak, X-Ray Computed Tomography in Medicine and Medical Imaging (Springer, 2009)

The laboratory can only be completed if the module "Finite Elements 1" is simultaneously attended or successfully completed. The laboratory is given in English.

The course comprises development of apps for mobile devices in the field of mechatronics and medical technology. The target operating system is Android. A special focus is on the design and implementation of apps using the IDE Android Studio and the library Vuforia. Further topics of the course are visualization concepts, mixed reality, object recognition, navigation, etc.

Module Content:
- Introduction to Android Studio and Vuforia
- Visualization concepts
- Mixed reality
- Object recognition
- Navigation

Module Assessment:
- Project work
- Participation in lectures and tutorials

Module Literature:
- Atala, Lanza, Thomson, Nerem: Principles of Regenerative Medicine
- Original literature

The laboratory provides an overview of image acquisition techniques and signal processing methods in the field of medical imaging, such as computer tomography, MRI and ultrasonic imaging. The course teaches various image acquisition techniques and signal parameters. This is concluded with information about case histories and applications. Further topics cover methods based on the evaluation of time series signals, like electrocardiogram (ECG) and pulse oximetry. Special emphasis is put on the computer tomography method by giving a deeper insight into the three-dimensional volumetric image reconstruction process and various influencing image quality by means of the stepwise implementation of a simple computer CT image reconstruction algorithm within the tutorial.

Module Assessment:
- Written examination
- Project work
- Participation in lectures and tutorials

Module Literature:
- Atala, Lanza, Thomson, Nerem: Principles of Regenerative Medicine
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<th>Lecture Course</th>
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<th>ECTS</th>
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<tr>
<td>Fundamentals and Configuration of Laser Beam Sources</td>
<td>Laserzentrum Hannover, Institut für Technik und Automationstechnik</td>
<td>German</td>
<td>- Fundamentals of laser beam sources - Operation regime of lasers - Characteristics of lasers</td>
<td>32</td>
<td>118</td>
<td>Lecture script</td>
<td>- Originalliteratur</td>
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| Laser Spectroscopy in Life Sciences | English | The aim of this lecture is to introduce to the fundamentals and methods in laser spectroscopy for applications in the life sciences. Apart from the basic principles of laser spectroscopic techniques and methods applied in various life science areas of fundamental research and practical applications in the field such as biotechnology, chemistry, and medicine, will be taught. The students will also gain insight into modern measurement devices and methods and also be trained practically. The exercise course aims at consolidating the understanding of the basic principles given as well as at their application for practical examples. | Demtröder, Laser Spectroscopy in Life Sciences: Basics (Springer, 2008) |}
| Nonlinear Optics | English | Nonlinear optics is a branch of optics in which the optical response of a medium is no longer proportional to the intensity of the light field. The nonlinear behavior of light can be described by a change in the refractive index, polarization, reflectivity, and other properties of the medium. | Boyd, Nonlinear Optics (Academic Press, 2003) |}
| Numerical Methods and Simulation Strategies in Theoretical Physics | English | In this lecture we illustrate a computational theoretical approach to selected problems in modern physics, e.g., to single molecule waves, ground states of large wave systems and a simple Monte Carlo algorithm. Topics of the lecture include the extended model. The course offers a large variety of practical information on optical methods, which may be of great interest for future research. | Davis, Introduction to Computational Physics, 3rd ed. (Springer, 2013) |
| Optical Coatings and Layers | English | Optical coatings can be considered as essential key components in modern Photonics, for example, present laser sources, optical systems and products or even a major part of fundamental research cannot be realized without optical coatings. In this course the fundamentals of coating design, production and characterization of functional layers will be presented. Present research areas of optical coating technology, especially in the fields of high precision industrial production and the optimization of coating systems for high laser beams will be introduced and discussed. The course offers a large variety of practical information on optical methods, which may be of great interest for future research. | Peck, Optical Coatings and Layers (Springer, 2000) |}
| Photogrammetric Computer Vision | English | After attending this module, the students have a good overview and detailed knowledge of some exemplary methods of image and video sequence analysis, e.g., image stabilization, 3D reconstruction from images, and registration. The students also learn how to apply these methods in practice. | Forsyth, David A. and Simon Hay. (2003). Computer Vision: A modern approach. Prentice Hall. |}
Physics of Solar Cells

Semiconductor equations, optical properties of semiconductors, transport of electrons and holes, carrier recombination mechanisms, current-voltage curves, manufacture of solar cells, characterization methods for solar cells, physical limitations for efficiency improvements, new concepts.

Solid State Lasers

Solid state lasers are used in a variety of applications, including laser surgery, laser printing, and laser lighting. The physics of solid state lasers is covered in this course, including the generation of laser light, the properties of laser beams, and the use of lasers in various applications.

Ultrashort Laser Pulses

Ultrashort laser pulses are used in a variety of applications, including optical coherence tomography, optical microscopy, and optical communication. The physics of ultrashort laser pulses is covered in this course, including the generation of ultrashort laser pulses, the properties of ultrashort laser pulses, and the use of ultrashort laser pulses in various applications.

Photonics

The students gain special knowledge in nonlinear and integrated optics, and they can select and deepen independently by the student. The topics shall be presented in the frame of a seminar with a subsequent discussion. Besides their technical competence, the students develop their methods in literature research, implementation of technical and scientific knowledge, as well as their presentation techniques together with their ability to lead scientific discussions.

Proseminar Biophotonics

The focus of the proseminar lies on the applications of optical technologies, methods and communication systems in the life sciences. The students acquire knowledge on the basic concepts and their implementation in real applications. Typical fields of application are optical microscopy and imaging, as well as the development of optical methods and integrated laser systems for medical screening, among others.

Satellite Remote Sensing I

The students learn the basics of remote sensing, with emphasis on satellite technology, the measurement of geophysical parameters with satellites, and the theoretical exercises on the communication skills and methodological competence.

Satellite Remote Sensing II

The students are learning the basics of remote sensing of the land masses, the oceans and the atmosphere. Apart from boosting expert knowledge, the theoretical exercises also train communication skills and methodological competence.

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<tbody>
<tr>
<td>Global Electronic Business</td>
<td>Students understand the importance and usage of Electronic Business, information systems (IS) and information technology (IT) in globally present companies. They understand the most important terms and can use the technical language. They know basic methods and models of Electronic Business supported and enabled by IS, IT and the Internet. The students get familiar with specific international topics such as E-commerce, mobile commerce and e-collaboration.</td>
<td>Primarily PPT slides, further references are given individually from the supervisors.</td>
<td>6 180 28h 152h</td>
<td>WS</td>
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<td>Intercultural Economics and Management</td>
<td>The students get familiar with specific intercultural topics such as food economics in a wider sense. Eating and drinking behaviors largely differ between countries and cultural regions. The cultural differences also affect the sustainability and upgrading of national and international value chains with international business becoming increasingly integrated. The cultural differences also affect the sustainability and upgrading of national and international value chains.</td>
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<td>Strategic International Management</td>
<td>The students will be introduced to some fundamental concepts, frameworks and models of strategic and international management. The course connects state of the art research with practical questions of companies operating in an competitive and international environment. Students will reflect on effective management, strategic alliances and networks, appropriate leadership styles and decision-making behavior in international companies and develop respective management skills.</td>
<td>Northouse, P. G. (2010): Leadership: Theory and Practice, Los Angeles et al., Sage House, R. J. (2004): Leadership, culture, and organization: The GLOBE study of 62 societies, Thousand Oaks (USA), Sage House, R. (2009): International Management: Managing the Global Organization, London et al. Further literature will be announced during the course.</td>
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