ESSLINGEN
UNIVERSITY

INTAP

INTERNATIONAL AUTOMOTIVE ENGINEERING PROGRAM

Esslingen University
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HTTPS://WWW.HS-ESSLINGEN.DE/EXCHANGE-PROGRAMMES-KEEP-INTAP

Faculty of Mobility and Technology
and International Centre

Design: www.weiser-design.de - Satz: Hochschule Esslingen - Stand: November 2021

INTRODUCTION

The International Automotive Engineering Program, INTAP, was originally developed in conjunction with Kettering University (former GMI) in Flint, Michigan, USA.

The basic idea was to extend international student exchanges. The primary objectives were to offer interesting lectures in automotive competency and to give participants cultural and historical impressions. In addition the program offers a variety of field trips to the German car industry, its suppliers and other scenic places in Germany. The credits of the lectures are usually accepted at our partner universities.

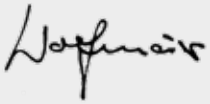
In the meantime we have developed INTAP into one of the most important and one of the most successful international programs at Esslingen University. The program has been running for more than 20 years. During the last couple of years we have focussed more and more on the international aspect in its proper meaning. This means that we try to accept students of different nationali-ties from partner universities all over the world in order to give the student the opportunity to learn from other cultures and mentalities. The program is offered to the open market, which could well be one of the main attractions of INTAP.

The lectures start once a year in the fall semester, running from October to December. In September the International Office organizes an orientation program consisting of an intensive German Class at beginners and advanced levels, assistance with administrative procedures and the opportunity to get in touch with other international students. These orientation weeks are a mandatory part of the program, as they make the integration here much easier.

Each semester the International Office of Esslingen University will provide the coordinators of our partner universities with the exact application deadline, information about the application procedure and program schedule. Therefore, please contact your coordinator for more detailed information. The course language is English. The number of participants is limited to 20 members.

We are looking forward to receiving your applications.

You are warmly welcome!



Prof. Christof Wolfmaier
President of Esslingen University

Prof. Berkemer
Academic Coordinator INTAP

TABLE OF CONTENTS >>>>>>

CHOICE OF COURSES

PROPULSION SYSTEMS
Prof. Dr.-Ing. Michael Auerbach
Phone +49(0)711 397-3487, Michael.Auerbach@hs-esslingen.de,
Room S 02.001

BASIC ELEMENTS OF FEEDBACK CONTROL TECHNOLOGY
Prof. Dr.-Ing. Joachim Berkemer
Phone +49(0)711 397-3376, Joachim.Berkemer@hs-esslingen.de,
Room S 04.005

COMPUTER SIMULATION IN AUTOMOTIVE ENGINEERING
Prof. Dr.-Ing. Thomas Schirle
Phone +49(0)711 397-3232, Thomas.Schirle@hs-esslingen.de,
Room 14.204

FINITE ELEMENT ANALYSIS (FEA)
Prof. Dr.-Ing. Carsten Block
Phone +49(0)711 397-3203, Carsten.Block@hs-esslingen.de,
Room 05.105

FLUID MECHANICS
Prof. Dr.-Ing. Christian Saumweber
Phone +49(0)711 397-3633, Christian.Saumweber@hs-esslingen.de,
Room S 02.210

GERMANY AT A GLANCE
M.A. Mr. Holger Starzmann
E-Mail: Holger.Starzmann@hs-esslingen.de

GERMAN AS A FOREIGN LANGUAGE
Team of German Language Lecturers

IMPORTANT CONTACT INFORMATION

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POLICE
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EMERGENCY/FIRE BRIGADE
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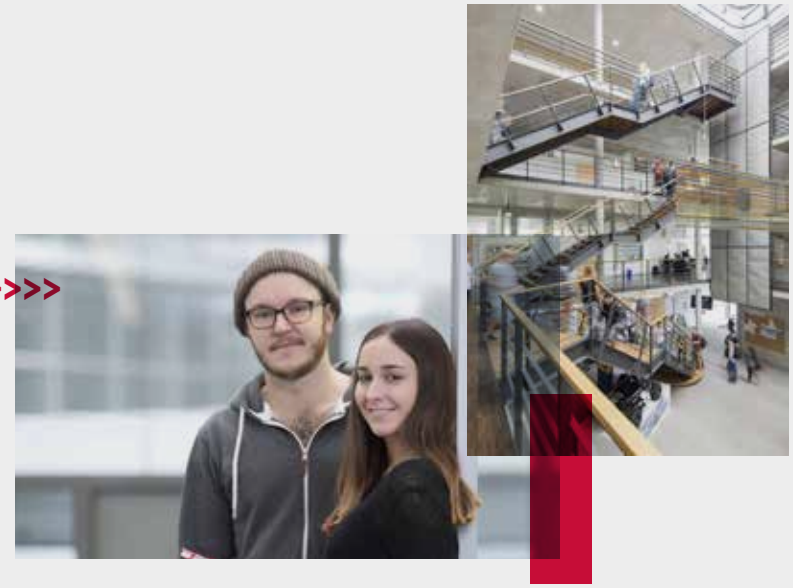

FIELD TRIPS

AS PART OF THE PROGRAM "INTERNATIONAL FRIENDS"

- Heidelberg (castle and historic town center)
- Lake Constance (Zeppelin museum, castles and historic town center, boat trip)
- Tübingen (city tour with historical site visits)

AS PART OF DEPARTMENTAL ACTIVITIES

- Mercedes plant, Sindelfingen
- Mercedes plant, Stuttgart-Untertürkheim
- Porsche plant, Stuttgart-Zuffenhausen
- Audi plant, Neckarsulm
- Robert Bosch plant, Reutlingen or Stuttgart-Feuerbach

A selection of the excursions from the above list is planned every year.

PROPULSION SYSTEMS

INSTRUCTOR

Professor Dr. Michael Auerbach

PREREQUISITES

- Basic knowledge on engines, electrical drives and gearboxes
- Basic knowledge in electrical engineering
- Basic knowledge in mechanical design

TOPICS (1 h = 45min)

Part 1 Basics on components

- Vehicle performance: Demands for drivelines
- Propulsion Systems Basics
- Electrical Systems
- Gearboxes and Components
- Combustion Engines
- Powertrain Simulation using Matlab/Simulink

Part 2 Powertrain Development

- ICE-driven Propulsion Systems
- Hybrid Propulsion Systems
- Pure Electric Propulsion Systems

>>> Total 40 h

TEXTBOOK/REFERENCE MATERIALS
Lecture notes, exam samples with solutions

ASSESSMENT & COURSEWORK
Written Midterm and Final exam (2 x 90min)

ESTIMATED ABET CATEGORY CONTENT
Theory: 4 credits

ECTS CREDITS
4 credits

GOALS >>>>>>

The course gives an insight on current and future technologies for propulsion systems by exploring electric, electrified and also classic propulsion systems.

BASIC ELEMENTS OF FEEDBACK CONTROL TECHNOLOGY

INSTRUCTOR
Prof. Dr.-Ing. Joachim Berkemer

PREREQUISITES
- Mathematics
- Applied Mechanics
- Electric Circuits

TOPICS (1 h = 45 min)
- Introduction to continuous-time control
- Descriptions of control loop elements
- Elementary transfer elements (P, I, D, dead time
- Lag elements (PT1, IT1, DT1, PT2)
- Composition of transfer elements for control equipment
  Modelling of transfer systems
- Nyquist plots, Bode diagrams, stability
- Controller design and control loop synthesis

>>> Total 40 h

TEXTBOOK/REFERENCE MATERIALS
Lecture scripts with notes, exercises with solutions.
Further reading:
H. Abel, Hermann Kull, J. van der List, D. P. Looze, G. Walliser: Feedback Control Technology, Esslingen University of Applied Sciences
J. Di Stefani, A. Stubberud, I. Williams: Feedback and Control Sysstems. Schaum's Outlines, McGraw-Hill.

ASSESSMENT & COURSEWORK
Written Midterm and Final exam (2x 90 min)

ESTIMATED ABET CATEGORY CONTENT
Theory: 4 credits

ECTS CREDITS
4 credits

GOALS >>>>>>

The course should give the basic theoretical knowledge necessary for the use of modern applications of control technology.

COMPUTER SIMULATION IN AUTOMOTIVE ENGINEERING

INSTRUCTOR
Professor Dr. Thomas Schirle

PREREQUISITES
- Mathematics (desirable but not mandatory): solution of systems of linear ODEs, eigenvalues and eigenvectors
- Engineering mechanics, linear vibration theory
- Basic Computer programming (desirable but not mandatory): any programming language

TOPICS (1 h = 45 min)
- Simulation and simulation tools in automotive engineering
- Notation: processes, systems, models, state systems
- Mathematical modeling of a car suspension
- Introduction to MATLAB/SIMULINK
- Numerical aspects: integration methods, stability, accuracy treatment of nonlinearities (play, dry friction, stops, etc.)

LABORATORY PROJECTS (1 h = 45 min)
- Modeling, programming and simulation of a car suspension
- SIMULINK model of a car suspension
- SIMULINK S-Function for embedding of user defined models
- State Space form of a car suspension LTI model
- Automatic linearization of nonlinear systems
- Modeling approaches for a nonlinear shockabsorber
- „Skyhook" damping concept for active suspenison systems
- Active suspension system with road preview (mechanics, hydraulics, control)
- Simulation of system performance

>>> Total 40h

TEXTBOOK/REFERENCE MATERIALS
Printed handout

ASSESSMENT & COURSEWORK
Written Midterm and Final exam (2x 60 min)

ESTIMATED ABET CATEGORY CONTENT
4 credits

ECTS CREDITS
4 credits

GOALS >>>>>>

- **To understand basic concepts, strength and weaknesses of dynamic systems simulation in the design process**
- **To apply software for programming and dynamic system simulation (MATLAB/ SIMULINK)**
- **To gain insight into possible numerical effects and suitable solver methods**

FINITE ELEMENT ANALYSIS (FEA)

INSTRUCTOR
Professor Dr. Carsten Block

PREREQUISITES
Basic courses in engineering mechanics and mathematics

TOPICS (1 h = 45 min)
- Introduction to finite element analysis and ANSYS
- Data transfer from CAD to FEA
- Modelling, meshing, applying loads and boundary conditions
- Determination of displacements and stresses in beams, trusses and three-dimensional bodies
- Validation and Verification in FEA

Laboratory Work
- Introduction to ANSYS Workbench
- Application to example problems (beams, trusses, three-dimensional bodies)

Group Project
- Use of FEA to solve an engineering problem
- Documentation in a professional engineering report

>>> Total 40 h

TEXTBOOK/REFERENCE MATERIALS
Lecture notes

ASSESSMENT & COURSEWORK
in-class exercises; project work

ESTIMATED ABET CATEGORY CONTENT
Theory and practical work: 4 credits

ECTS CREDITS
4 credits

<<<<<< GOALS

- Formulate, analyse, and verify mechanical system analysis problems using an industry standard finite element analysis (FEA) software
- Understand the structure and operation of a commercial FEA program (ANSYS)
- Analyse deformations, forces, strains and stresses under a variety of loading conditions, including static and dynamic load cases.

FLUID MECHANICS

INSTRUCTOR
Professor Dr. Christian Saumweber

PREREQUISITES
Experimental Physics

TOPICS (1 h = 45 min)
- Properties of Fluids
- Hydro- and Aerostatics
- Hydro and Aerodynamics
  - Stream Filament Theory
  - Introduction to Gas Dynamics
  - Flows with Friction
  - Dimensional Analysis

>>> Total 40 h

TEXTBOOK/REFERENCE MATERIALS
Lecture scripts with notes, exam samples with solution
Further reading:
Graebel, W.P.: Engineering Fluid Mechanics, Taylor & Francis, 2001.
Anderson, J.: Fundamentals of Aerodynamics, 6th edition, McGraw-Hill, 2016

ASSESSMENT & COURSEWORK
Written Midterm and Final exam (2x 90 min)

ESTIMATED ABET CATEGORY CONTENT
4 credits

ECTS CREDITS
4 credits

<<<<<< GOALS

This course is an introduction to the fundamental concepts of fluid dynamics. It provides the basic tools necessary to apply the conservation principles of mass, momentum and energy to non-viscous and viscous fluids in the analysis of engineering systems.

GERMANY AT A GLANCE: HISTORY, POLITICS AND CULTURE

INSTRUCTOR
M.A. Mr. Holger Starzmann

PREREQUISITES
None

TOPICS (1 h = 45 min)
- Introduction: general aspects of German history
- The first Germans and the Romans
- The Mediaeval period - Encounter between Orient and Occident
- The Reformation and Restoration
- Formation of the Prusso-German nation-state and World War I
- The Weimar Republic
- The Third Reich and World War II
- Germany in a bipolar world
- The rush to German unity
- The German political system
- People and Culture: Language, Religions, Holidays and Traditions
- Todays Germany in Europe and in the European Union

TEXTBOOK/REFERENCE MATERIALS
- Detwiler, D.S. A Short History of Germany. Southern Illinois University Press, 1989
- Fulbrook, Mary. German History Since 1800. . London: Bloomsbury Academic, 2010
- Jarner, Peter, ed. Modern Germany: Politics, Society and Culture.m London: Routledge, 1998
- Jones, Alun. The New Germany: A Human Geography. New York: Wiley/Longman,1994
- Jarausch, Konrad H. The Rush to German Unity. Oxford University Press, 1994
- Wehling, Hans-Georg. The German Southwest. Baden-Wuerttemberg: History, Politics, Economy and Culture. Stuttgart: Kohlhammer, 1991
- Fulbrook, Mary. German History Since 1800. . London: Bloomsbury Academic, 2010
- Additional materials, maps, newspaper and online articles and handouts
- Online-Sources:
  http://www.spiegel.de/international/
  http://edition.cnn.com/
  http://www.ft.com/home/europe

ASSESSMENT & COURSEWORK
- Oral presentation and final exam
- Participation in class

ESTIMATED ABET CATEGORY CONTENT
4 credits

ECTS CREDITS
4 credits

GOALS >>>>>>

This course introduces students to German history from the Middle Ages to the Berlin Republic. It covers major events in medieval and early modern times, such as the German Reformation and the Thirty Years War, but the main focus is on the nineteenth and twentieth centuries.
In particular, the course will involve the study of the German Confederation, the formation of the Prusso-German nationstate and the imperial era, the period of the World Wars, and the history of the two Germanys after the end of the Third Reich and their path to the reunification. On completion of the focus on history, students will be familiar with basic knowledge in German geography, the political system and the cultural legacy of Germany.

GERMAN AS A FOREIGN LANGUAGE LEVEL A1

INSTRUCTOR
M.A. Ms. Karin Böse-Janissek

PREREQUISITES
No technical prerequisites.
Participation of the online assessment test before arrival

TOPICS (1 h = 45 min)
The basic course covers a large amount of practical training of the German standard language. Typical matters of the students in everyday situations are important. Emphasis is placed on developing and training sound communicative skills to be able to function independently in all situations inside and outside the university.
A variety of basic topics and authentic situations from daily life are used, e.g. grocery shopping, small talk, orientation in the city.

MAIN GRAMMATICAL TOPICS
- Conjugation of verbs (regular and irregular) in the present tense, verbs with vowel change
- Personal pronouns, possessive pronouns
- Genders of nouns, definite and indefinite articles, negative articles in nominative and accusativeW-questions, yes/no questions
- Modal verbs „können“ (be able to), „mögen“ (like to), „möchten“ (would like to)
- Negative statements
- Preterite (simple past) of „haben“ (have) and „sein“ (be)
- Singular, plural
- Connectives „aber“ (but), „oder“ (or), „und“ (and)
- Word order in statements, W-questions, yes/no questions, sentences with modal verbs.
- Time indications.

PROJECTS
1 excursion – visiting a production company
(e.g. Kessler Sekt – Esslingen)

TEXTBOOK/REFERENCE MATERIALS
Information about the textbook and additional learning materials will be given by the teacher in the first lesson

ASSESSMENT & COURSEWORK
Final exam
Participation in class

ESTIMATED ABET CATEGORY CONTENT
4 credits

ECTS CREDITS
4 credits

Students arriving with a good command of German language may take the assessment test for German language classes for STIPUS students and, depending on the test performance, join the courses at advanced levels.

GOALS >>>>>>

The International Office offers “German as a foreign language” courses on different levels for international exchange students and free mover students. During orientation, students participate in a brief written test and oral inter-view to evaluate which level fits best. Small groups allow students an active exchange of ideas with teachers and other students. During the courses, students will apply skills required for communication in the German standard language and – for advanced learners – in the scientific language

EXAMPLE OF A TYPICAL INTAP SCHEDULE

TIME	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
07:35 am – 09:05 am					
09:30 am – 11:00 am	Computer Simulation		Propulsion Systems	Field trip	Feedback Control
11:15 am – 12:45 pm	Computer Simulation	Fluid Mechanics	Propulsion Systems	Field trip	Feedback Control
02:00 pm – 03:30 pm		Fluid Mechanics	FEA	Field trip	
03:45 pm – 05:15 pm			FEA	Field trip	
05:30 pm – 09:00 pm		Germany at a glance	German as a foreign language	Field trip