INTAP
INTERNATIONAL AUTOMOTIVE ENGINEERING PROGRAM

Hochschule Esslingen
University of Applied Sciences
Kanalstrasse 33
73728 Esslingen
Germany
Phone: +49(0)711 397-3116

WWW.HS-ESSLINGEN.DE/INCOMING

Faculty of Automotive Engineering
and International Office
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 Hochschule Esslingen – University of Applied Sciences. The program has been running for more than 15 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 nationalities 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 level, 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 Hochschule Esslingen 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 24 members.

We are looking forward to receiving your applications.

You are warmly welcome!

Prof. Wolfmaier
Dean of the Faculty of Automotive Engineering
INTAP Coordinator
### CHOICE OF COURSES

**ALTERNATIVE POWERTRAIN**  
Prof. Werner Klement  
Phone +49(0)711 397-3346, Werner.Klement@hs-esslingen.de  
Room S 02.008

**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**  
Dipl.-Ing. Thomas Schirle  
Phone +49(0)711 397-3232, Thomas.Schirle@hs-esslingen.de  
Room

**FINITE ELEMENT ANALYSIS (FEA)**  
Dr. Gerald Scheday  
Phone +49 179 464-0305, Gerald.Scheday@de.bosch.com

**FLUID MECHANICS**  
Prof. Dr. Thomas Hanak  
Phone +49(0)711 397-3416, Thomas.Hanak@hs-esslingen.de  
Room S 04.214

**GERMANY AT A GLANCE**  
tbd

**GERMAN AS A FOREIGN LANGUAGE**  
M.A. Karin Böse-Janissek  
Phone +49(0)7161 155-44, Norbert.Janissek@t-online.de

### IMPORTANT CONTACT INFORMATION

**INTERNATIONAL OFFICE**  
incoming@hs-esslingen.de

**FACULTY OF AUTOMOTIVE ENGINEERING**  
Kremena Daneva  
Phone +49(0)711 397-3335, Kremena.Daneva@hs-esslingen.de

**FACULTY OF AUTOMOTIVE ENGINEERING**  
Dean Prof. Dipl.-Ing. Christof Wolfmaier, INTAP Coordinator  
Phone +49(0)711 397-3300, +49(0)711 397-3332, Mobile +49(0)171 314-5923  
Christof.Wolfmaier@hs-esslingen.de

**POLICE**  
Phone 110 (all over Germany)

**EMERGENCY/FIRE BRIGADE**  
Phone 112 (all over Germany)
FIELD TRIPS

AS PART OF THE PROGRAM “INTERNATIONAL FRIENDS”
- Neuschwanstein (castle)
- 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
- Daimler AG, Sindelfingen
- Daimler AG, Stuttgart-Untertürkheim
- Porsche AG
- Audi Assembly Line, Neckarsulm
- Gottlieb-Daimler-Birth-Building, Schorndorf
- Robert Bosch GmbH, Reutlingen or Stuttgart-Feuerbach

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

ALTERNATIVE POWERTRAIN

COORDINATOR
Prof. Werner Klement

PREREQUISITES
- Knowledge about powertrain
- Mechanical design
- Basic knowledge in electrical engineering

TOPICS (1 h = 45 min)
Part 1 | Electrical drives
- Electrical drives – some basics 2h
- Power electronics 6h
- Control systems for DC-motors 4h
- Control systems for AC-drives 4h
- Innovative battery-systems for E-Vehicles 2h
- Simulation of DCDC-converter, DC- and AC-drive with Matlab/Simulink 5h

Part 2 | Hybrid
- Vehicle performance date: Demands for drivelines 4h
- Planetary gear sets: Torque, speed, power split 8h
- Hybrid systems: Parallel, serial; others, THS, Two mode 10h

>>> Total 45 h
The course gives an overview about new technologies in the drivelines. These are electrical drives and the combination of electrical machine and combustion engine (Hybrid solutions).

The course should give the basic theoretical knowledge necessary for the use of modern applications of control technology.
COMPUTER SIMULATION IN AUTOMOTIVE ENGINEERING

COORDINATOR
Dipl.-Ing. Thomas Schirle

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

TOPICS (1 h = 45 min)
Notation: processes, systems, models, states, systems of ODEs
Related mathematics (repetition): eigenvalues, eigenvectors, solution of systems of ODEs, stability
Modeling, discretization and numerical integration;
Integration scheme of Euler, Trapezoidal rule;
Runge-Kutta methods; steps of the simulation process
Related numerical mathematics: stability, accuracy,
regions of stability, stiff systems; nonlinearities and their numerical treatment: play, dry friction, stops, etc.; simulation software
Simulation models in automotive engineering

LABORATORY PROJECTS (1 h = 45 min)
Analysis and simulation of electronic circuits with Pspice
A simple 2-mass nonlinear vibration model in C
Introduction to MATLAB/SIMULINK and its simulation tools
Engine/drivetrain simulation in SIMULINK
Introduction to ACSL; A simple model in hydraulics
Vehicle dynamics simulation and animation with CASCaDE

>> Total 20 h

TEXTBOOK/REFERENCE MATERIALS
Printed handout in English language (86 p.)

ASSESSMENT & COURSEWORK
Midterm exam, final exam

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 related software (MATLAB/SIMULINK, ACSL, ADAMS, DADS, SPICE, CAS DaDE, e.g.)
- To gain insight into, and to deal with, possible numerical problems when applying simulation software
**FINITE ELEMENT ANALYSIS (FEA)**

**COORDINATOR**
Dr. Gerald Scheday, Robert Bosch GmbH

**PREREQUISITES**
Basic Courses in Applied Mechanics, Mathematics and Mechanics of Materials.

**TOPICS**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constitutional Equations of the Finite Element Method</td>
<td>10h</td>
</tr>
<tr>
<td>Element Formulations (1D, 2D and 3D)</td>
<td>4h</td>
</tr>
<tr>
<td>Quality and Error in Discretization and Numerics</td>
<td>5h</td>
</tr>
<tr>
<td>Outlook to nonlinear Material and Large Strain Formulations</td>
<td>1h</td>
</tr>
</tbody>
</table>

>>> Total 20h

**LABORATORY PROJECTS**

<table>
<thead>
<tr>
<th>Project</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to ANSYS Workbench</td>
<td>10h</td>
</tr>
<tr>
<td>Finite Element Analysis at appropriate Examples</td>
<td>10h</td>
</tr>
</tbody>
</table>

>>> Total 20h

**TEXTBOOK/REFERENCE MATERIALS**
Printed handout

**ASSESSMENT & COURSEWORK**

- Midterm exam, final exam

**ESTIMATED ABET CATEGORY CONTENT**
Theory and practical work: 4 credits

**ECTS CREDITS**
4 credits

**GOALS**
- Theoretical basic Knowledge in Finite Element Method
- Pre-/Postprocessing in commercial Software (ANSYS Workbench)
- Evaluation and Interpretation of Finite Element Analysis (FEA)

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**FLUID MECHANICS**

**COORDINATOR**
Prof. Dr. Thomas Hanak

**PREREQUISITES**
Introductory physics and mathematics courses.

**TOPICS**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>2h</td>
</tr>
<tr>
<td>Fluid statics</td>
<td>4h</td>
</tr>
<tr>
<td>Elementary fluid dynamics – The Bernoulli equation</td>
<td>8h</td>
</tr>
<tr>
<td>Fluid kinematics</td>
<td>4h</td>
</tr>
<tr>
<td>Finite control volume analysis</td>
<td>8h</td>
</tr>
<tr>
<td>Viscous flow in pipes</td>
<td>8h</td>
</tr>
<tr>
<td>Flow over immersed bodies</td>
<td>6h</td>
</tr>
</tbody>
</table>

>>> Total 40h

**TEXTBOOK/REFERENCE MATERIALS**

**ASSESSMENT & COURSEWORK**

- There will be one midterm and a final examination. All exams will be closedbook, but a handwritten cheat sheet (about letter size) will be allowed.
- The final grade will be determined as follows:
  - Midterm exam 30%
  - Final exam 70%
- A list of suggested homework exercises from each chapter of the textbook will be posted.

**ESTIMATED ABET CATEGORY CONTENT**
4 credits

**ECTS CREDITS**
4 credits

This course is an introduction to the fundamental concepts of fluid statics and 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 (SOCIAL SCIENCE ELECTIVE 300 LEVEL)

COORDINATOR

TBD

PREREQUISITES

Only for Kettering University: HUMN 201, SSCI 201, COMM 101

TOPICS (1h = 45 min)

- Introduction: general aspects of German history
- The first Germans and the Romans
- The Mediaeval period and the Thirty Years War
- 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
- Today's Germany in Europe

TEXTBOOK/REFERENCE MATERIALS

- Jarausch, Konrad H. The Rush to German Unity.
- Additional materials, maps, newspaper and online articles and handouts
- Online-Sources:
  - http://www.spiegel.de/international/
  - http://www.ft.com/home/europe

ASSESSMENT & COURSEWORK

- Midterm (multiple choice test) and final exam (essay test)
- Participation in class

ESTIMATED ABET CATEGORY CONTENT

4 credits

ECTS CREDITS

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 A1

COORDINATOR
M.A. Karin Böse-Janissek

PREREQUISITES
No prerequisites

TOPICS  (1 h = 45 min)
- Communication activities
- Basic German sounds, rules of spelling, sentence structure, grammar
- Arrivals
- Communication e-mail
- My life
- Travel
- In town
- Places
- People
- Work
- Leisure
- Stories
- The past

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

TEXTBOOK/REFERENCE MATERIALS
Schritte International 1: Kurs- und Arbeitsbuch/Hueber (Europäischer Referenzrahmen)

ASSESSMENT & COURSEWORK
Final exam

ESTIMATED ABET CATEGORY CONTENT
4 credits for Kettering students

ECTS CREDITS
8 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

This course will be an introduction to speaking, reading and writing German. It will provide the basic knowledge in the German language and grammar necessary to communicate in everyday situations.
## EXAMPLE OF A TYPICAL INTAP SCHEDULE

<table>
<thead>
<tr>
<th>TIME</th>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>07:35 am – 09:05 am</td>
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</tr>
<tr>
<td>09:30 am – 11:00 am</td>
<td>Computer Simulation</td>
<td>Fluid Mechanics</td>
<td>Alternative Powertrain</td>
<td>Feedback Control</td>
<td>Field trip</td>
</tr>
<tr>
<td>11:15 am – 12:45 pm</td>
<td>Computer Simulation</td>
<td></td>
<td>Feedback Control</td>
<td>Field trip</td>
<td></td>
</tr>
<tr>
<td>02:00 pm – 03:30 pm</td>
<td>Fluid Mechanics</td>
<td>FEA</td>
<td>Alternative Powertrain</td>
<td>Field trip</td>
<td></td>
</tr>
<tr>
<td>03:45 pm – 05:15 pm</td>
<td>Germany at a glance</td>
<td>FEA</td>
<td></td>
<td>Field trip</td>
<td></td>
</tr>
<tr>
<td>05:30 pm – 07:00 pm</td>
<td>Germany at a glance</td>
<td>German as a foreign language</td>
<td></td>
<td>Field trip</td>
<td></td>
</tr>
</tbody>
</table>