International Summer Program (ISP)

Track A: Engineering

Track B: German and European Studies
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German Language Course
- Compulsory Class for Track A and B

German Language Course
Lecturers
TBA

Time
Mondays, 10:00-13:00
Wednesdays, 16:00-19:00

Location
TBA

Course Description & Aim of lecture
For beginners of German we will offer the German A1.1 course. This class focuses on the introduction to the German language, simple oral and written communication, and basic German grammar. The following competences are imparted:
Students who pass the course successfully will be able to provide information about themselves and their country of origin; to greet and to say goodbye; to talk about their family; to express their condition, preferences and resentments; to talk about their hobbies and leisure time; to make and understand time designations; to name prices and quantities; to name things of everyday life (groceries, furniture); to phrase simple questions; to talk about simple activities and events in the past tense.

For intermediate students of German we will offer more advanced courses on the levels required.

The textbook "Schritte plus: Deutsch als Fremdsprache" (1 through 6 according to the course level) will be used in class. The German language course meets twice a week throughout the 7 weeks of the lecture period. This corresponds to 4.5 ECTS credit points or 3 credit hours.

Exam
There will be a final written exam.
Germany – Politics, Culture and Society

- Compulsory Class for Track A, Elective Class for Track B

Germany – Politics, Culture and Society

Lecturers
TBA

Time
2 Saturdays - TBA

Location
TBA

Aim of lecture
The German culture course “Germany-Politics, Culture, and Society” is designed to introduce students to Germany’s cultural landscapes and political life. You will gain insights into your host country’s past and present and will be encouraged to contribute your own first-hand experiences to class discussions.

Description
The compact seminar covers the following topics:

- General introduction to Germany
- Topic specific workshops on German politics (including short student presentations)
- German history before and after World War II, including reunification (the material includes nonfiction, historical texts, and visual material)
- German literature (short overview and some examples)
- German culture (including German food culture, sports, music)
Germany – Politics, Culture and Society
- Compulsory Class for Track A, Elective Class for Track B

• Migration in Germany: introduction to the topic; discussion of migration including a contemporary German film on the topic

• The Ruhr Area (focus on this specific region, its history and culture)

This course is a mandatory seminar for students who take classes exclusively from Track-A Engineering. If you attend classes from Track B-German and European Studies, you may choose whether to take part in this course. You will meet on two separate days at the beginning and at the end of the program for one day of compact seminar each.

Requirements

Interest in Germany

Weekly hours/ ECTS points

The compact seminar will be taught on two separate days, corresponding to 1.5 ECTS credit points or 1 credit hour
Part I
Track A - Engineering
### Possible course selection for engineering and science majors:

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- Pharmacy/Pharmaceutical Engineering
- Other Engineering
- Mechanical Engineering
- Electrical Engineering
- Computer Science
- Business and Administration
- Automation and Robotics
- Biochem. and Chem. Engineering
- Biology
- Business and Administration
- Computer Science
- Electrical Engineering
- Mechanical Engineering
- Mathematics
- Mechanical Engineering
- Other Engineering
- Pharmacy/Pharmaceutical Engineering
- Biochem. and Chem. Engineering
- Business and Administration
- Computer Science
- Electrical Engineering
- Mechanical Engineering
- Mathematics
- Mechanical Engineering
- Other Engineering
- Pharmacy/Pharmaceutical Engineering
- Biochem. and Chem. Engineering
- Business and Administration
- Computer Science
- Electrical Engineering
- Mechanical Engineering
- Mathematics
- Mechanical Engineering
- Other Engineering
- Pharmacy/Pharmaceutical Engineering
Chapter 1
Economics and Business Administration
Chapter 1

Economics and Business Administration

1.1 Concepts and Cases in International Marketing

Lecturers
Prof. Dr. Hartmut H. Holzmüller
M.Sc. Sabrina Heix

Time
Thursdays, 16:00-19:00
Fridays, 12:00-15:00

Location
Thursdays: HGII – HS4
Fridays: Chemistry HS4

Aim of lecture/ Lecture content

This course provides an introduction into issues and problems commonly encountered in strategy formation and decision making by companies operating on an international scale. Students of the course shall

1.) become more sensitive to international marketing issues and develop an understanding of current problems that international marketers face on global markets,

2.) develop a knowledge of concepts and methods used in international marketing theory and business practice,

3.) be capable of applying the presented framework, concepts, and methods, to typical issues in international marketing management.

Cases will help you to develop strategic thinking in an international marketing context and will provide you with an
Chapter 1
Economics and Business Administration

opportunity to sharpen your verbal and written communication skills. Utilizing a teaching approach that mixes cases, class discussions, group workshops, you will learn key concepts and tools used in solving international marketing problems.

Requirements

Basic knowledge in marketing.

Weekly hours/ ECTS points

The lecture will be taught 6 hours/ semester-week which corresponds to 7.5 ECTS credits

Exam

Choice between
a) written and graded exam covering the entire class (both Concepts and Cases, 90 minutes),
b) Case Studies (1/3)+ written and graded exam on Concepts (60 minutes, 2/3) (mode will be announced in time)

Recommended Reading

Economics Dortmund International Summer Program 2012

- A reading pack with cases and background notes will be available at the Department of Marketing.
- Website: [http://www.wiso.tu-dortmund.de/wiso/m/de/lehre/veranstalt/sose_17/Concepts_and_Cases/index.html](http://www.wiso.tu-dortmund.de/wiso/m/de/lehre/veranstalt/sose_17/Concepts_and_Cases/index.html)
Chapter 1
Economics and Business Administration

1.2 Industrial Marketing

Lecturers
Prof. Dr. Tobias Schäfers

Time
Lecture: Tuesdays, 14:00-16:00
Study Section (Tutorials): Wednesdays, 08:00 – 10:00

Location
Chemistry – HS 2 (Building 12) (Tuesdays)
HG II – HS 4 (Building 13) (Wednesdays)

Aim of lecture
The course will provide participants with advanced knowledge about decision models, planning methods, and specific instruments of industrial marketing management. After the course, participants will (a) know the specificities of marketing in a business-to-business context, (b) be able to analyze organizational buying processes and to derive implications for marketing and sales approaches, (c) have the theoretical knowledge and practical insights on how to design and implement B2B marketing strategies for different business types, (d) be able to independently design, carry out, and analyze research projects on B2B marketing topics.

Lecture content
Buying behavior and thus marketing in business-to-business (B2B) settings are in many ways different from business-to-consumer (B2C) settings. This module provides advanced marketing students with insights about marketing of industrial goods and services to business customers. In
addition to fundamental aspects of B2B marketing (e.g., organizational buying behavior), topics such as industrial sales and distribution and industrial brand management will be covered. Participants will learn the specific aspects of applying marketing theories and designing marketing strategies in B2B settings. Contents of this module include: (1) fundamental characteristics of industrial marketing management, (2) organizational buying processes, (3) marketing research for industrial markets, and (4) the general and business type specific development of marketing activities and programs for industrial markets. In addition to traditional teaching methods, participants will work on and discuss case studies to directly apply course contents and deepen the understanding of industrial marketing.

Tutorials and Laboratory

The lecture will be accompanied by a weekly tutorial / study section in which students will work on and discuss case studies and apply the lecture contents to business problems.

Requirements

None

Weekly hours/ ECTS points

ISP students attend only the second half of the lecture. The participation in the “Markstrat B2B Business Simulation” is not offered for ISP students. This corresponds to 2 hours/semester-week and 3.5 ECTS credits

Exam

Written exam
Chapter 1
Economics and Business Administration

Recommended Reading


Website:

Chapter 1
Economics and Business Administration

1.3 International Business (Bachelor)
Lecturers

Prof. Dr. Tessa Flatten
M.Sc. Lea Mergemeier

Time

Tuesday, 16:00 - 19:00
Wednesday, 10:00 - 13:00
Starting on June 13th, 2017

Location

Mathematics Building – Room 127

Aim of lecture/ Lecture content

The module provides a comprehensive understanding of business strategies under consideration of external and internal influences as well as international aspects. Based on this, the module discusses growth strategies and cultural influences for international companies and underlines the distinct role of innovations in this context.

Requirements

None
Chapter 1
Economics and Business Administration

Weekly hours/ ECTS points

The lecture will be taught 4 hours/ semester-week which corresponds to 7.5 ECTS credits

Exam

Students can choose between two types of examination:
1) 100 % of total course points in exam (90 minute-exam)
2) 2/3 of total course points in exam (60 minute-exam), 1/3 of total course points in student presentation

Website:  http://www.wiso.tu-dortmund.de/wiso/btm/de/lehre/veranstaltungen/sommersemester/IB/index.html
Chapter 2
Biochemical and Chemical Engineering
Chapter 2
Biochemical and Chemical Engineering

2.1 Fundamentals of Biochemical Reaction Engineering

Lecturers
Prof. Dr.-Ing. Rolf Wichmann

Module Information:

This Module consists of two courses:

- Biotechnological Processes (2.2)
- Biochemical Reaction Engineering (2.3)

Alternatively it is possible to attend only one of the courses.

Weekly hours/ ECTS points

The module will be taught in 4 hours/ semester-week which corresponds to 5.5 ECTS

Exam

The written examination will cover topics from both lectures.
Chapter 2

Biochemical and Chemical Engineering

2.2 Biotechnological Processes

Lecturers
Prof. Dr.-Ing. Rolf Wichmann

Time
Mondays, 08:15 - 9:45 (10:00 – 12:00 July 3\textsuperscript{rd}, 2017)

Starting on June 12\textsuperscript{th}, 2017

Location
BCI – ZE 07 (Building 6)

Aim of lecture
The audience should gain knowledge about the scope and the limits of the application of biotechnological processes.

Lecture Content
Biotechnological processes applied in areas like food processing, production of valuable biochemicals, pharmaceuticals and intermediate products, as well as an introduction to the application of animal and plant cell systems, biosensors and biological waste treatment are presented. This lecture is combined with the lecture “Biochemical reaction engineering” (see following course) to form the module “Fundamentals of biochemical reaction engineering”. It is foreseen to take the exam of the module, but the ISP students are welcome to let the lecturer know, if they are willing to take one of the exams individually.
Requirements

Fundamental knowledge in chemistry is required. Additional knowledge in the fundamentals of biochemistry and microbiology would significantly help to understand the presented lecture, but are not mandatory.

Tutorials

Not included

Laboratory

On a voluntary basis

Weekly hours/ ECTS points

The lecture/tutorial will be taught 1 hours/ semester-week which corresponds to 1.5 ECTS

Exam

Written

Recommended Reading

Chapter 2

Biochemical and Chemical Engineering

2.3 Biochemical Reaction Engineering

Lecturers
Prof. Dr.-Ing. Rolf Wichmann

Time
Tuesdays, 08:15 – 10:45
Thursdays, 08:30 – 11:00

Location
Tuesdays: BCI – ZE 07 (Building 6)
Thursdays: BCI – ZE 07 (Building 6)

Aim of lecture

The lecture and tutorial Biochemical Reaction Engineering teaches the fundamentals of fermentation and enzyme technology.

Lecture Content

- Introduction
- Enzyme reaction engineering
  a) Classification of enzymes
  b) Kinetic of enzymatically catalysed reactions
  c) Examples of application of enzymes
  d) Enzyme retention by membranes
  e) Enzyme retention by immobilization
- Fermentation technology
  a) Preparation of a fermentor
  b) Sterilisation of the fermentor and the nutrient solutions
Chapter 2

Biochemical and Chemical Engineering

c) Production of inocculum material for fermentations
d) Fermentation in batch mode: Progress + kinetics
e) Fermentation in continuous mode: Balance +
determination of optimal operating points
f) Mixed population of microorganisms
g) Oxygen demand + aeration of aerobic fermentations
h) Process control

This lecture is combined with the lecture “Biotechnological Processes” (see previous course) to form the module “Fundamentals of biochemical reaction engineering”. It is foreseen to take the exam of the module, but the ISP students are welcome to let the lecturer know, if they are willing to take one of the exams individually.

Requirements

Fundamental knowledge in chemistry is required. Additional knowledge in the fundamentals of biochemistry and microbiology would significantly help to understand the presented lecture, but is not mandatory.

Weekly hours/ ECTS points

The lecture/tutorial will be taught 3 hours/ semester-week which corresponds to 4 ECTS Credit Points.

Exam

Written

Recommended Reading
A script is available on request.
Chapter 2

Biochemical and Chemical Engineering

2.4 Dynamic Simulation

Lecturers

Prof. Dr.-Ing. Sebastian Engell
Dipl.-Ing. Sven Wegerhoff

Time

Mondays, 15:00 – 18:00

Location

BCI – PC-Pool 1 (Building 6)

Aim of the lecture

The goal of the course is that the student obtains an understanding how dynamic process simulators work and is able to formulate, solve and analyze problems in advanced dynamic process simulators.

Lecture Content

The course dynamic simulation teaches the theoretical and practical use of advanced dynamic process simulators. The software used is gPROMS, a commercial equation-oriented modelling and optimization framework, which is widely used in the chemical industry. In order to teach the students the handling and implementation in gPROMS, the following topics are dealt with:

- Basics of numerical mathematic:
  - Types of dynamics systems
  - Numerical stability
  - Numerical solution of ODEs
Chapter 2
Biochemical and Chemical Engineering

- Basics of gPROMS
  - Implementation of basic models
  - Solving basic models in gPROMS
- Object oriented programming in gPROMS
  - Theory of object oriented programming
  - Realization in gPROMS
- Logical conditions and scheduling in gPROMS
- Numerical solutions of partial differential equations
  - Discretization methods
  - Initial and boundary conditions
- Implementation of partial differential equations in gPROMS
- Dynamic optimization
  - Basics of optimization theory
  - Solving of dynamic optimization problems
  - Dynamic optimization of chemical processes in gPROMS

Requirements

The students should be able to derive models of chemical processes and to understand given process models.

Weekly hours/ ECTS points

The lecture will be taught 1.5 hours/ semester-week which corresponds to 1.5 ECTS credits.

Exam

Written (computer-based)

Specials

The number of participants is limited to 32 (Dortmund Programs + Summer Program).

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Chapter 2

Biochemical and Chemical Engineering

Website:

http://www.dyn.bci.tu-dortmund.de/de/lehre/biw/master-biw/dynamic-simulation
Chapter 2

Biochemical and Chemical Engineering

2.5 Logistics of Chemical Production Processes

Lecturers
Prof. Dr.-Ing. Sebastian Engell

Time

Thursdays, 14:15 - 15:45
Fridays, 08:00 - 10:00

Starting on June 15th, 2017

Location

Thursdays: BCI – ZE 07 (Building 6)
Fridays(Tutorial): PC-Pool1/ZE 07

Aim of the lecture

The students obtain an overview of supply chain management and planning and scheduling problems in the chemical industry and of techniques and tools for modelling, simulation and optimization. These include discrete event simulation, equation-based modelling, mixed-integer linear programming, heuristic optimization methods and modelling and optimization using timed automata.

The students will be enabled to identify logistic problems, to select suitable tools and techniques for simulation and optimization and to apply them to real-world problems.

Lecture Content

1. Introduction to Batch Processes and Supply Chain Management
Chapter 2

Biochemical and Chemical Engineering

2. Discrete event simulation: problem abstraction, classification, queuing policies, random number generation, probability distributions

3. Scheduling: Gantt Charts, Terminology and generic problem representation, machine environments, state task networks (STN), resource task networks (RTN), classification of batch scheduling problems, uniform discrete and non-uniform continuous time representation, campaign and moving horizon scheduling

4. Linear programming: Properties of linear programs, graphical method, simplex method

5. Mixed Integer Linear Programming
   Integer and binary variables, branch and bound algorithm, concept of relaxation, concept of convex hull, search algorithms

6. Modeling: Modeling with binary variables, contingent decisions, Big “M” constraints, case-study: production of EPS (expandable polystyrene)

7. Heuristic optimization: Exact and heuristic optimization, heuristic algorithms, meta heuristic algorithms, classification of search techniques

8. Scheduling with timed automata: Comparison of MI(N)LP and TA, TA modeling, semantics, reachability analysis, reduction techniques, reactive scheduling

Tutorial and laboratory contents

1. Paper-based supply chain management game
   Bullwhip effect, decisions with limited information

2. Discrete event simulation with INOSIM Professional (computer-based): Recipe driven simulation of a paint
Chapter 2

Biochemical and Chemical Engineering

factory

3. Production scheduling with Schedule Pro and Lekin (computer-based): Dispatching rules, impact of sequence-dependent changeovers, campaign scheduling

4. Mixed Integer Linear Programming (paper-based): modeling and solution of MILPs, graphical solution, branch and bound algorithm

5. Modeling and Optimization with AIMMS (computer-based): Building of graphical user interface, economic optimization of EPS production

6. Timed Automata Scheduling with TAOpt (computer-based)

Requirements

Higher mathematic courses, physics, basic knowledge in organic and inorganic chemistry

Weekly hours/ ECTS points

The lecture will be taught 2 hours/ semester-week which corresponds to 3 ECTS credits.

Exam

Written final exam

Recommended Reading

Chapter 2

Biochemical and Chemical Engineering

Website:  http://www.dyn.bci.tudortmund.de/de/lehre/chemieingenieurwesen/master-pse/-logistics-of-chemical-production-processes
Chapter 2

Biochemical and Chemical Engineering

2.6 Bubbles and Drops in chemical and biochemical processes

Lecturers
Prof. Dr. Norbert Kockmann

Time
Wednesdays, 10:00 – 14:00
Thursday, July 27th, 2017, 13:00 – 14:00
Starting on June 14th, 2017

Location
Lecture: BCI – G3.425 (Building 6)
Exam: Chemistry – HS3

Aim of lecture
Methods of generation, application and basics of discrete multiphase systems

Lecture Content

Requirements
Basic knowledge in Flow Mechanics
Chapter 2
Biochemical and Chemical Engineering

Tutorials

Calculation of typical applications in process engineering

Laboratory

Demonstration of gas dispersing systems, atomizers and gas driven films. Demonstration of particle forming processes in liquid / gas and liquid / liquid systems

Weekly hours/ ECTS points

The lecture/tutorial will be taught 2 hours/ semester-week which corresponds to 3 ECTS credits

Exam

Oral or Written

Recommended Reading

All slides presented will be given to attendants of the course together with recommendations of the literature
2.7 Introduction to Programming with MATLAB

Lecturers
Prof. Dr.-Ing. Sebastian Engell or assistant

Time
TBA

Location
TBA

Aim of lecture
This lecture is thought as an introduction to programming in MATLAB. It should introduce into basic concepts of programming and give an overview over the most important elements of MATLAB. The aim of the course is to enable the participates to use the MATLAB programming language to write small applications for processing data and give a slight introduction into using MATLAB to solve small optimization problems.

Lecture Content
The contents of the lectures are:

1. Introduction to basic concepts of programming
2. Using MATLAB as a calculator
3. Basic data-structures
4. Conditional execution and loops
5. Advanced data-structures
6. Reading data and graphical output
7. Using numerical methods with MATLAB
Chapter 2
Biochemical and Chemical Engineering

Requirements
None

Tutorials
In the tutorials the students will get the opportunity to use MATLAB to solve tasks by themselves, which is an important part to learn programming. Therefore the participation in the tutorials is mandatory.

Laboratory
None

Weekly hours/ ECTS points
The lecture will be taught 1.5 hours/ semester - week which corresponds to 1.5 ECTS credits.

Exam
Written exam (60 minutes)
Chapter 3
Automation and Robotics
3.1 Process Optimization

Lecturers
Prof. Dr.-Ing. Sebastian Engell

Time
Mondays, 08:00 – 10:00
Tuesdays, 10:00 – 12:00

Location
Mondays, BCI – ZE02 Lecture
Tuesdays, PC-POOL 1 Tutorial

Aim of lecture
At the end of the lecture the students are capable to solve different (industrially relevant) types of optimization problems.

Requirements
Basic Mathematics (linear algebra, functional analysis), basic knowledge of differential equations, and basic knowledge of MATLAB.
Lecture Content

- Introduction to mathematical optimization, types of optimization problems, basics of convex analysis

- Scalar optimization problems: Definition and properties, optimality conditions, solution methods (interval bracketing, golden-section method, steepest-descent method, secant method, Newton method), convergence, applications

- Multidimensional optimization problems: Definition and properties, optimality conditions, solution methods (simplex method, Nelder-Mead method, steepest-descent method, quasi-Newton methods, Newton method, conjugate gradient method), line search, convergence, applications

- Metaheuristics search: Definition and properties, solution methods (simulated annealing, tabu search, evolutionary algorithms, applications

- Constrained optimization problems: Definition and properties, convexity, optimality conditions, KKT conditions, duality principle, solution methods (Newton method, generalized reduced gradient method, active set method, interior-point methods, sequential quadratic programming), sensitivity analysis, applications

- Linear programming: Definition and properties, applications, optimality conditions, duality principle, solution methods (Dantzig’s simplex algorithm, interior-point methods)
Chapter 3

Automation and Robotics

- Quadratic programming: Applications, optimality conditions, solution methods, Introduction to Linear Model Predictive Control
- Dynamic optimization problems: Definition and properties, solution methods (sequential, simultaneous and multiple shooting techniques), applications, extensions to Nonlinear Model Predictive Control

Tutorials

Applications of the methods presented in the lectures are realized on exemplary case studies related to processing industries and other engineering domains in the computer-based tutorial sessions using MATLAB.

Weekly hours/ECTS points

The lecture/tutorial will be taught 4 hours/week which corresponds to 4.0 ECTS credits.

Exam

Written, closed book

Recommended Reading

Slides presented at the lecture will be handed out to attendants of the course. The course covers selected topics from the following standard textbooks:


Chapter 3

Automation and Robotics


Website:

https://www.dyn.bci.tu-dortmund.de/de/lehre/automation-and-robotics/processoptimization
3.2 Data-based Dynamic Modeling

Lecturers
Prof. Dr.-Ing. Sebastian Engell

Time

- Wednesdays, 08:30 – 10:00
- Thursdays, 16:00 – 17:30

Starting on June 14th, 2017

Location

- Wednesdays: BCI – ZE 07 (Building 6)
- Thursdays: BCI – ZE 07 (Building 6)

Aim of lecture

- Concepts of models, which can be identified from data
- Judging the quality and the limitations of data-based models
- Theory and basic calculations of the z-transformation

The students can identify the dominant dynamics of a process from step responses and can apply modern methods and algorithms to identify the parameters of linear process models from measured data. The students know the concept of the z-transformation. They know the structure of nonlinear black box models and can judge the quality and the limitations of data-based models.
Chapter 3

Automation and Robotics

Requirements

The students should know basic concept of the Laplace-transformation and transfer functions.

Lecture Content

This lecture deals with different linear and non-linear black-box models.

The identification of the parameters of these models is the first topic, beginning with the identification of simple models from step responses. The goal is here is to find a model of a system by looking at its step response. Stable or unstable systems, systems with over- and/or undershoot or oscillating systems can be modeled by simple transfer functions in the Laplace-domain. Methods like Kupfmüller or Schwarze can be applied to given step responses. The identifiability of poles and zeros of transfer functions also depends on their position in the complex plane.

The next types of models, which are covered in this lecture, are linear transfer functions in the (sampled) z-domain. An introduction to sampling and problems which arise from sampling are discussed (e.g. Shannon theorem). The z-transformation is introduced and calculation rules e.g. for inverse transformations are discussed and applied. The relation between transfer functions in the s- and z-domains (position of the poles, transformation) is discussed.

An important class of black-box models is described as prediction error methods. The theory behind ARX, ARMAX and OE models is explained in detail. Different methods for the numerical parameter estimation (linear and nonlinear
Chapter 3

Automation and Robotics

Numerical least squares estimation) are discussed. The capability of representing a systems behavior by such models is highly dependent on the model order. Accuracy and overfitting are discussed.

The last part is about modeling using nonlinear black box models (perceptron neural nets, radial-basis-function nets). Concepts of training and the usage of neural networks as dynamic models are introduced. The quality of neural net models is discussed.

Tutorials

The lectures are supported by tutorials, in which the concepts are applied. Some of the tutorials are computer-based and are carried out in a computer lab. The tutorial contents are listed below:

- Step response identification (Methods of Kupfmüller, Strejc and Schwarze)
- Computer lab: Step response identification: Validation of graphical methods / Optimization-based step response identification (with MATLAB)
- Discrete-time systems / z-Transform
- Computer lab: ARX parameter estimation (with MATLAB)
- Computer lab: Prediction error methods (with MATLAB)
- Non-linear black box modelling

Weekly hours/ ECTS points

There are 8 lectures and 7 tutorials. Each lecture and each tutorial is 1.5 hrs (total: 22.5 hrs). The estimated total time effort is 77 hrs. including lectures, tutorials and preparation.

ECTS Credits: 2.5

Exam
Chapter 3

Automation and Robotics

The students are graded with an assignment (15%) and one written exam (85%). The assignment is an application example, which has to be solved using a computer. The solution has to be described and submitted.

Recommended Reading

Website:
http://www.dyn.bci.tu-dortmund.de/de/lehre/automation-and-robotics/system-identification
Chapter 3

Automation and Robotics

3.3 Cyber-Physical System Fundamentals

Lecturers
Prof. Dr. Jian-Jia Chen

Time
TBA

Location
Otto-Hahn-Str. 14 - 104 (Building 26)

Aim of lecture
The aim of this course is to provide an overview over fundamental techniques of designing embedded systems (information processing systems embedded into products such as telecommunication systems, vehicles or robots). At the end of the course, the student will be able to put the different areas of embedded systems into perspective and to understand more specialized topics, such as timing predictability, modeling, scheduling, or performance evaluation.

Lecture Content, Website
The compact seminar covers the following topics:
• Introduction of Cyber-Physical Systems
Motivation, Application Areas, and Challenges in Design
• Specifications and Modeling
Models of Computation (i.e., State Charts, SDK, Dataflow, Petri nets, Discrete Event Modeling),
• CPS-Hardware: Discretization, Memory Systems, Sampling Theory, and Signal Converter
• System Software: Real-Time Operating Systems, Resource access protocols, and Middleware
Chapter 3

Automation and Robotics

- Evaluation and Validation: Multi-objective optimization, Real-Time Calculus, Dependability Analysis
- Application Mapping: Scheduling, Dependency, and Design Space Exploration

The course is organized as an inverted classroom. Students are asked to watch the lecture at home and do the theoretical exercises together with the lecturer in the classroom and the practical exercises in lab sessions. There will be lab assignments to let students get familiar with the modeling tools, embedded hardware platforms.


The course on cyber-physical systems fundamentals can be seen on youtube as well:

http://www.youtube.com/user/cyphysystems

Requirements

Basic education in computer science or computer engineering; we assume that students are familiar with at least one programming language (preferably C/C++ or Java) and do understand computer structures (at the level of Hennessy/Patterson: Computer Structures), finite state machines, NP completeness, simple electronic circuits and systems of linear equations. Typically, we expect students to be third year undergraduates or graduate students. EE or ME students should study the above subjects before attending the course.
Chapter 3
Automation and Robotics

Tutorials and Laboratory
1.5 hrs per week The content of laboratory can be itemized as follows:

• StateChart Tutorial on IAR development board (3 weeks)
• VHDL-simulations : Syntax and Semantics (2 weeks)
• Robotic Application on LEGO Mindstorms (3 weeks)

Weekly hours/ ECTS points

The lecture/ tutorial will last 2 hours/ semester-week (+1.5 hours Laboratory) which corresponds to 3.5 ECTS credits

Exam

To participate the written exam, the students have to pass at least 50% of total points in each lab session.

Recommended Reading


Minimum number of participants

None
Chapter 4
Applied Mathematics
4.1 Intensive Course in Statistics

Lecturers
TBA

Time
TBA

Location
TBA

Aim of lecture
The course gives an introduction to statistical concepts that are useful for research projects in various fields of application and areas of science.

Lecture Content
Website: http://www.statistik.tu-dortmund.de/intensivecourse0.html


Table of content:
1. Introduction (random experiments, random variables, sample space)
2. Empirical distributions and exploratory data analysis (frequency tables, bar charts, histograms, distribution characteristics)
3. Probability theory (probability, conditional probability, independence, total probability, Bayes rule)
4. Random variables and their distribution (discrete distributions (Uniform, Bernoulli, Binomial, Hypergeometric, Poisson), continuous distributions (Uniform, Normal), expectation and variance, sampling distribution theory, joint distributions, covariance and correlation

5. Estimation and confidence intervals (properties of estimators, Maximum Likelihood estimator, confidence intervals)

6. Hypothesis testing (Test of statistical hypotheses (Binomial test, Gaussian test, t-test, approximate tests), power, p-value)

7. Regression (simple / multiple regression, tests concerning regression)

8. Time series analysis (descriptive time series analysis (moving average, differencing), stationarity)

Requirements

Except for basic mathematical calculus no prior knowledge is necessary.

Tutorials and Laboratory

The tutorial will be used to practice the course material by solving statistical problems and to further discuss student questions. The statistical computer package R will be introduced for statistical programming and used by the students to analyze small data sets. This includes theoretical tutorials and software labs.
Exam

The ECTS points are credited for passing the written exam.

Weekly hours/ ECTS points

Duration: 7 weeks
- 10 lectures
- 6 theory tutorials
- 4 software lab

Recommended Reading

Basics of Probability and Statistics:

Basics of R:
4.2 Numerical Solutions of Differential Equations

Lecturers:
Prof. Dr. Stefan Turek, Dr. Abderrahim Ouazzi

Time
TBA

Location
TBA

Aim of the lecture:
The aim of this lecture is to help students to get familiar with the basic properties of mathematical techniques for the numerical treatment of (ordinary) differential equations, including initial value as well as boundary value problems. This lecture is conceptualized as preliminary course for the treatment of partial differential equations.

Requirements:
The participants must have a solid background in Linear Algebra and Calculus. In particular, knowledge on and practice in the basics of Applied Mathematics (numerical differentiation/integration, interpolation/approximation, iterative solvers) are required, as well as basic experience with programming languages (C, Fortran, Java, etc.) or MATLAB for the numerical exercises.
Lecture content:

- Introduction to Differential Equations: Notations, Definitions, Formulation and Classification of Differential Equations, Theory for Initial Value Problems
- Numerical Methods for Initial Value Problems: One-Step-Methods, Galerkin-Methods, Stiff Problems

Exam:

All students are requested to successfully solve (at least) 50% of weekly offered home assignments. The final exam will be an oral or written exam, depending on the number of participants.

Weekly hours/ ECTS points:

The lecture/tutorial will last 2 hours/semester-week (+1 hours Tutorial and Laboratory) which corresponds to 5 ECTS credits.

Recommended Reading:

Will be provided during lecture

Minimum number of participants: 5
4.3 FEATFLOW Lab

Lecturer:
Prof. Dr. Stefan Turek

Location and Time:
Upon request (please contact the lecturer)

Lecture content:
Computational exercises and examina for the course Numerics Lab including highly sophisticated pre- and postprocessing tools will be offered on the basis of the CFD package FEATFLOW

Exam:
Method of examination upon consultation with the students

Recommended Reading:
TBA
Part II
Track B - German & European Studies
Chapter 5
Courses for German & European Studies
Chapter 5
Courses for German & European Studies

5.1 German and European Cultural History (2 HS)
154675

Lecturers
Jan Hildenhagen

Time
Duration: 13.06.2017-25.07.2017
Tuesdays, 16:00 – 19:15

Location
EF 50 – R.0.406 (Building 8)

Course Description
This course is a part of the TU Dortmund University summer program and is open to all international students, both participants of the summer program and regular exchanges. As a seminar in the intercultural classroom format, it is also open to German students, especially of the Angewandte Studiengänge. The seminar is based on Tony Judt’s seminal book *Postwar: A History of Europe since 1945*, published in 2005. Using this text, students will enter into a dialogue with the instructor and each other regarding the development of Germany and Europe in the past sixty years and investigate their transatlantic and transnational context(s).
5.2 Coffee & Cafés - A Beverage & its Cultural Impact (2 PS) 154642

Lecturers
Bernd Eßmann

Time
Duration: 15.06.2017-21.07.2017
Thursdays, 12:15 – 15:30

Location
EF 50 – R.0.420 (Building 8)

Course Description
Coffee is a ubiquitous beverage that we usually take for granted without reflecting on the impact it has on our culture(s). We will take a closer look at it, specifically the places that it is frequently – & publicly – consumed in, the cafes. Be those traditional cafes (the coffeehouses in Vienna come to mind) or rather recent developments such as Starbucks. In this course we will try to find out their function in our culture(s), to find out whether cafes are, as Ray Oldenburg puts it, "hangouts at the heart of a community". For this we will take a look at the US and Germany, but especially also the perspective of the International Summer Program participants will give us valuable insights.
Chapter 5

Courses for German & European Studies

5.3 Revolution: How German and American Youth Clashed with Authority in the 1960s-1980s (2 PS) 154644

Lecturers
   Danielle Pisechko

Time
   Duration: 12.06.2017-24.07.2017
   Mondays, 14:15 – 17:45

Location
   EF 50 – R.0.406  (Building 8)

Course Description
   As the first post-war generation came of age in the 1960s, the entire world was shaken by their revolutionary spirit. Throughout the 1960s, 70s, and 80s, both Germany and the United States found themselves disrupted by social, political, and cultural protests, orchestrated in large part by these emerging “baby boomers”. From civil rights sit-ins, to free speech protests in Berkeley, to the Studentenbewegung of 1968, the expressions of revolution were vast, varied, and transatlantic in scope.

   In this course, we will explore the types of protests and the forms the various movements took. Whether it was organized civil rights marches or the more freeform counterculture phenomenon, we will investigate the effectiveness and long-term consequences of this generation’s actions.
While we will be reading a variety of primary and secondary source material from the era, we will also be listening to music from artists such as Bob Dylan and there will be a screening of at least one film of the Anti-Heimat movement/New German Cinema. In the same way that the revolutionary spirit of the young people in Germany and the United States permeated all aspects of their lives, so will we, too, be exploring the artistic and personal sides of these movements.

During the course of the class, students will also do a presentation on a protest or set of protests during this time and draw connections to recent (post-2000) protests or movements.
5.4 “Take the Mic!”: The Cultural Politics of Spoken Word and Slam Poetry (2 PS) 154645

Lecturers
Laura Kost

Time
Duration: 13.06.2017-25.06.2017
Tuesdays, 08:30 – 11:45

Location
EF 50 – R.0.420 (Building 8)

Course Description
So called “slams” and poetry readings currently enjoy great popularity in Germany and the United States. But what does it take to be a Slammer? What is the essence of competitive poetry? And more importantly, what are the social and cultural influences and implications behind these texts?

In this comparative class the students will get to know the theory and practice behind Spoken Word and Poetry Slam together with a survey on their history and development. We will focus on the role of slam as a cultural practice and analyze its unique dynamics and status as a medium of protest and literary movement from an academic perspective. Students will read and write spoken word and slam texts, comparing and contrasting practices of slam in the U.S. and Germany, which allows for a transnational focus. Especially for international students the class provides the possibility to engage in discourse with Dortmund students and to experience an interesting use of the German language. Exchange students should therefore have at least basic knowledge of German.
5.5 American Architects and Architecture: Visions, Utopia and Literary Representations (2 PS) 154647

Lecturers
Barbara Berendt-Metzner

Time
Duration: 16.06.2017-28.07.2017
Fridays, 08:30 – 11:45

Location
EF 50 – R.0.420 (Building 8)

Course Description
"Architecture can be read like any other text – and vice versa" - The course will explore this thesis by looking at and into American architecture from the 19th and 20th century. Emphasis will be put on the individual house rather than the planning of urban space. Is there an American architecture and if so, what makes it specifically American? America’s history is a history of settlement and development and American architecture had and has a significant economic, social, political and psychological impact in this process and on the people who inhabit it.

From Andrew Jackson Downing’s philosophy of ”the good house that will lead to a good civilization” and Henry Thoreau’s cabin near Walden pond to Frank Lloyd Wright’s Usonian houses, influential visions and ideas of architecture have created an exciting American cultural narrative. Yet, many famous American architects of the 20th century originated from Europe and we will also look into architecture from a transatlantic, cross-cultural perspective.
5.6 Women-in-Science: Feminism in Carl Djerassi’s Science-in-Literature (2 PS) 154648

Lecturers
Dilara Serhat

Time
Duration: 14.06.2017-26.07.2017
Wednesdays, 08:30 – 11:45

Location
EF 50 – R.0.420 (Building 8)

Course Description
In his so-called “Science-in-Theatre” plays, Austrian-born Jewish-American chemist, novelist, playwright, and Stanford University professor Carl Djerassi (1923 – 2015), primarily known for his groundbreaking work on the birth control pill, touches upon a multitude of aspects relevant to science and the scientific world. In his own words, his aim is to “smuggle scientific facts” into the minds of “a scientifically illiterate public”. One of the central aspects in his literature is the role of women in the male-dominated world of science.

In this class, we will read and discuss several of Djerassi’s “Science-in-Theatre” plays and focus mainly – but not exclusively - on the representation of women in Djerassi’s literature. Questions we will deal with include: Why has science been so male-dominated? Do women do science differently? How does Djerassi portray female scientists compared to male scientists? How do the wives of scientists impact their husbands’ professional careers? How does science influence the concepts of motherhood, fatherhood, and family? A course pack will be made available for purchase at the beginning of the semester.
5.7 The Union at Risk; History and the Future of the European Union (2 PS) 154650

Lecturers
Jan Hildenagen

Time
Duration: 15.06.2017-27.07.2017
Thursdays, 16:00 – 19:15

Location
EF 50 – R.0.420  (Building 8)

Course Description
In the course of the so-called ‘economic and financial crisis’ that started in 2008, the European Union seems at risk, in particular after the so-called “Brexit” in 2016. Using journalistic and scientific articles, German and international students will enter into a transcultural dialogue with the instructor and each other regarding the history and the future development of the EU. Discussing various opinions and potential alternate models, the students hopefully will get a better understanding of the European Union in the context of “European identity” and broader international relations.
5.8 Creating the Cold War Canon (2 HS) 154668

Lecturers
Matthew Blackwell

Time
Duration: 15.06.2017-27.07.2017
Thursdays, 08:30 – 11:45

Location
EF 50 – R.0.406 (Building 8)

Course Description
Between 1954 and 1961, William Faulkner traveled the world as a Cold War cultural ambassador for the U.S. State Department. After his Nobel Prize win in 1949, Faulkner’s work, previously thought by many to be too willfully oblique to represent American literature as a whole, was instead heralded as an example of the U.S.A.’s cultural superiority over its Cold War rivals. Nor was Faulkner’s experience unique: throughout the Cold War, many authors, both living and dead, were held up as evidence of American artistic ingenuity. This class will examine American literature as it was read, taught, edited, and advertised both within the U.S. and internationally during this fraught era in political history. We will read a selection of canonical American authors and explore their importance to the U.S.’s attempt to establish a national literary tradition according to the needs of the Cold War context. Domestically, government programs including the GI Bill and the Center for Editions of American Authors ensured that American universities were full of new students, and that these students had definitive editions of the
most important American authors to read. Meanwhile, specific literary works were touted internationally as manifestations of American ideals. In this course, these processes will be put under the scrutiny of both American and European perspectives to reveal how our current conception of these works was shaped by Cold War culture.
5.9 “Bildung” – The German Philosophy of Education (2 HS) 122389

Lecturers
Lothar Wigger

Time
Starting on June 8\textsuperscript{th}, 2017
Thursdays, 10:00 – 14:00

Location
EF 50 – R.1.253 (Building 8)

Course Description
TBA
Part III
Appendix
## Timetable of Track A Example (of ISP 2015)

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### Morning Courses

- **Monday**
  - 08:00-10:00: Process Optim. (Engell) in BCI-ZE02 Building 6
  - 10:00-13:00: German Language Course
- **Tuesday**
  - 08:15-09:45: Biotechn. Processes (Wichmann) in BCI-ZE07 Building 6
  - 10:00-12:00: Process Optimization (Engell) in PC-Pool I Building 6
- **Wednesday**
  - 08:00-10:00: Industrial Marketing (Schäfers) in HGi-HS4 Building 13

### Afternoon Courses

- **Monday**
  - 14:00-16:00: Dynamic Simulation (Engell) in PC-Pool 1 Building 6
- **Tuesday**
  - 14:00-16:00: Industrial Marketing (Schäfers) in Ch - HS2 Building 12
- **Wednesday**
  - 16:00-19:00: German Language Course
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<tr>
<td>08:30-11:00 Biochemical Reaction Engineering (Wichmann) BCI-ZE07 Building 6</td>
<td>08:00-10:00 Logistics of chem. Prod. Proc. (Engell) PC-Pool 1 Building 6</td>
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<td>14:15-15:45 Logistics of chem. Prod. Processes (Engell) BCI-ZE07 (Building 6)</td>
<td>12:00 - 15:00 Concepts and Cases in International Marketing (Holzmüller) Ch-HS2 Building 12</td>
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<td>16:00-17:30 Data-based Dyn. Mod. (Engell) BCI-ZE07 Building 6</td>
<td>16:00-19:00 Concepts and Cases in International Marketing (Holzmüller) HGl-HS4 Building 13</td>
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