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IEEP – INTERNATIONAL ELECTRICAL ENGINEERING PROGRAM

Technische Hochschule Ulm
University of Applied Sciences

IEEP - International Electrical Engineering Program

Student Exchange Program
Spring 2021

Contents

Important Dates

For participants of German intensive language course

(The German intensive language course is ONLY offered for students without any or with little knowledge of German and voluntary, taking a German course during the semester is mandatory for all incoming students.)

Arrival:	**March 1st, 2021, 9:00 a.m. – 3:00 p.m.**
Registration and orientation:	**March 2nd, 2021, 9:00 a.m.** Campus Prittwitzstraße 10, Room E 03a
Intensive German class: Beginner Level 1 (A1.1)	**March 3rd - March 16th, 2021**
Ankommen in Deutschland, Language and Culture (requires completed A2!)	**March 3rd - March 10th, 2021**

Please arrange your arrival on March 1st between 9:00 a.m. and 3:00 p.m.

For students who will arrive in April

Arrival:	**April 6th, 2021, 9:00 a.m. – 3:00 p.m.**
Registration and orientation:	**April 7th, 2021, 9:00 a.m.** Campus Prittwitzstraße 10, Room E 03a

Please arrange your arrival on April 6th between 9:00 a.m. and 3:00 p.m.

Beginning of classes:	April 8th, 2021
Breaks:	
Easter:	April 2nd - April 5th, 2021
Labor Day:	May 1st, 2021
Ascension Day:	May 13th, 2021
Pentecost:	May 22nd – June 6th, 2021
Whit Monday:	May 24th, 2021
Corpus Christi:	June 3rd, 2021
Final exams:	June 14th - June 30th, 2021
Departure:	June 30th, 2021
Additional project work (4 weeks) optional	July 1st - July 30th, 2021

Students are welcome to stay at Ulm University of Applied Sciences for an additional month to work on a project in one of the university's laboratories.

Coordination

Department of Electrical Engineering and Information Technology

Prof. Dr.-Ing. Anestis Terzis
Academic Director of the IEEP
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International Office (Akademisches Auslandsamt)

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Application

- Students have to be nominated by their home university
  The home university sends an e-mail with names & email-addresses to Stephanie.Wagner@thu.de
- Students receive a link for the online-application

Accommodation

Accommodations will be booked by the International Office upon receipt of the housing request form. All students will stay in student residences, depending on availability. All rooms are single rooms. Kitchen and bathrooms are to be shared with other students. Please note: in Germany accommodation is not separated by gender. Bed sheets etc. will be provided. There will be no equipment for cooking. We recommend to bring or to buy a small amount of personal kitchenware.

Housing prices are between €350 and €400 per month. Students will be placed by the housing office (Studierendenwerk Ulm) on availability basis, unfortunately preferences cannot be considered. If you accept the room assigned, you have to sign the contract. A security deposit of €300 must be made upon arrival. The money will be withdrawn from your German bank account which you will need to open during the first days of stay. We will assist you in doing so.

The checking-in into the dorms is possible from **Monday through Friday, 9:00 a.m. to 4:00 p.m.**

Please note that check-in and check-out are **only** possible Monday-Friday. We will assign student tutors to assist you when checking-in. For check-out please make an appointment with the janitor in your dorm **at least 10 days before you plan to leave** in order to have your room inspected.

Exams

In case a student fails a course, i.e. is awarded a grade of 4.7 or worse, a re-examination may be done within 2 weeks after the announcement of the exam results. The examiner decides both the date and the form of the re-examination.
For conducting the re-examination the candidate has to be present in person. The exam may not be taken at the home university.

How to get to Ulm

From Stuttgart Airport:
Take the underground (S-Bahn) S2 or S3 to Stuttgart main train station (Hauptbahnhof – Hbf). It will take you about 30 minutes. At the main train station take a train to Ulm. Trains leave to Ulm about every hour. It will take you about 1 hour to get to Ulm.

From Munich Airport:
Take the underground to Munich main train station (Hauptbahnhof – Hbf). It will take you about 40 minutes. At the main train station take a train to Ulm. Trains leave to Ulm about every hour. It will take you about 1.20 hours to get to Ulm. Important: if you take IRE/RB/RE trains, be sure to get in the front part of the train since the train splits and only the front part goes to Ulm.

From Frankfurt Airport:
There are direct trains to Ulm from Frankfurt Airport. Trains leave to Ulm about every hour. It will take you about 2.15 hours to get to Ulm.

From Ulm main train station to Technische Hochschule Ulm
If you give us a call we will send a student tutor to pick you up at the main train station. Otherwise take bus no. 7 to bus stop “Kliniken Michelsberg” and walk down the hill.

Check **www.bahn.de** for train connections.

After you arrive

Tutors will help you organizing your stay in Ulm. They will show you the university, the city and they will accompany you to the different offices.

The Activity fee for each student is €93 (subject to change). You are allowed to take the city busses in Ulm and its surroundings every evening after 6 p.m. and on Saturdays, Sundays and public holidays free of charge by showing your Student ID card.

All European students please bring your EHIC-Card!

If you stay more than 3 month in Germany you have to go to the registration office in Ulm or Neu-Ulm and register in Germany. Student tutors will help you in filling out the needed forms and will accompany you to the registration office.

Within the first 2 weeks of your stay you will be provided with an e-mail account at Technische Hochschule Ulm. The computer rooms are open from Monday through Thursday from 7:30 a.m. until 8:00 p.m. and on Friday from 7:30 a.m. – 7:00 p.m. during the semester.

Some more useful information

For the Spring Term

In April it may still snow in Ulm so better bring some warm clothes. The temperatures in May and June can be quite warm and you may already use the outdoor swimming pools in June. If you want to do some traveling you should remember that southern Europe is a lot warmer at this time of the year.

In general

For company visits we recommend dress clothes.

When living in a student dorm, you do not need to bring bed linen. Blankets, sheets and pillows will be provided by the dorms but please bring your own towels. The floors will be shared with other students. Each floor has its own kitchen. The voltage in Germany is 230 Volt (50 Hz). You may buy an adapter to use electrical appliances here.

Copies of your passport, credit cards, driver's license etc. are very useful in case they are lost or stolen.

Most shops open at 8:00 a.m. and close normally at 8:00 p.m. There are some shops that are open until 9 p.m. or later, especially grocery stores. On Sundays every shop is closed.

Money

You will need a minimum of €860 for living expenses per month. Credit cards (most common is MasterCard, Visa and American Express) are honored in many places throughout Europe. Do not count on having your credit cards taken in every shop, but they are good to have in case of an emergency.

You will be required to open a German bank account in order to pay your rent and other expenses. This bank account is free of charge for students younger than 27 years and we will assist you in opening it. You can also use it to receive money from your parents, sponsor etc. via bank transfer. You may collect money at the automatic teller machine (ATM) using an ATM card with your personal identification number (PIN). Furthermore, the bank account will allow online banking.

Food

As the Technische Hochschule Ulm and your dorms are not far away from the city center there will be some supermarkets and grocery stores nearby to buy food and drinks. The student canteen (Mensa) offers two menus (one vegetarian) each day from Monday to Friday.

Dates

You may find the German way of writing dates is different from that which you are used to. To avoid any confusion when you are filling in documents, you should write dates as follows:

12th November 2021 = 12.11.2021 (12 = day, 11 = month, 2021 = year)

Some safety tips

Ulm is a safe city to live in and you should feel able to go out and about without fear. However as in most cities and countries throughout Europe you must use a common sense and be aware of your surroundings, particularly at night. Whenever possible, you should avoid walking alone at night and keep out of badly lit streets and lonely areas. Do not accept lifts from strangers and lock your room when you leave it. Let a friend or roommate know where and with whom you will be and do not leave your belongings unattended.

Field trips

Cultural field trips for example to Munich to visit the German Museum or to the Christmas market in Nuremberg will be organized by the International Office.

There will be several field trips to industrial companies (e.g. Porsche, BMW and Daimler), some of them combined with places of general interest. Attendance is required. If students have special interests, we will try to arrange a visit. The dates are mainly given by the visited company and may include Monday mornings or Friday afternoons.

We are looking forward to seeing you in Ulm!

Stephanie Wagner + Anita Everett + Jeanette Kolb (International Office)

IEEP Courses Overview

It is necessary to coordinate the courses that students want to take, with the corresponding department at their home University. Courses can be either compulsory, elective or just optional.

IEEP Course	Member of the Faculty	Credits
Digital Integrated Circuits	Prof. Dr.-Ing. Anestis Terzis	4
Control Technology	Prof. Dr. Michael Lux	4
Advanced Project Work	Professors of the faculty	4
Germany In The Last Three Centuries	Prof. Dr. Klaus Peter Kratzer	4
German Language Courses	Prof. Dr. Ben Dippe	2 / 3 / 5

Attendance at the lectures is required.

Digital Integrated Circuits

Department	Faculty „Electrical Engineering and Information Technology“
Coordinator	Professor Dr.-Ing. Anestis Terzis
Catalog Description	This is an introductory course presenting the fundamentals of digital integrated circuit design. This includes the basics of VHDL as well as the fundamentals of programmable digital circuit technology such as FPGAs. Exercises are carried out on workstations with state-of-the-art design software and FPGA development boards.
Prerequisites	Basic knowledge of digital technology
Class Schedule	per week: 4 periods (45 min) + additional time (1 hour) to complete lab exercises
Textbook	Own manuscript (in English) will be provided
References	Brock J. LaMeres, Introduction to Logic Circuits & Logic Design with VHDL, Springer 2017 Volnei A. Pedroni, *Digital Electronics and Design with VHDL*, Morgan Kaufmann, 2008 Peter J. Ashenden, *The Designer's Guide to VHDL,* 3rd Edition Morgan Kaufmann, 2008
Credits	4

Relationship to Program Educational Objectives

1. The students receive a thorough introduction to the digital integrated circuit technology. They get insight in the potential and restrictions in view of the digital circuit design for programmable logic integration.
2. The students get acquainted with basic VHDL concepts. They describe the behaviour of digital circuits theoretically using their knowledge in digital technology and perform simulations.
3. The students consolidate their knowledge by design entry and circuit simulation with the latest industry standard software and digital hardware boards.
4. Hardware experiments in the laboratory is provided in order to give a feeling of the real world, which can be compared with the theory and the simulation results.

Course Learning Objectives

Students who receive credit will have demonstrated the ability to do the following tasks.

1. Work with state-of-the-art EDA tools (Xilinx ISE® Design Suite).
2. Design and analyse combinational and sequential circuits for a circuit integration.
3. Create, debug and simulate digital designs based on VHDL.
4. Configure FPGAs and verify hardware operation based on development Boards.
5. Understand the EDA design processes (including IP-Core based design) as they relate to the FPGA design flow steps.
6. Describe fundamental architectures of digital programmable circuits like standard FPGAs and advanced System On Chip FPGAs.
7. Design digital systems which use embedded clock processing sub-systems of the chip.
8. Optimise the synthesized circuit according to specifications of timing constraints.
9. Verify the function of a digital circuit using a post place & route timing simulation in combination with HW tests.

Topics

1. Fundamentals of Hardware Description Language (VHDL):
   Basic elements of VHDL code, operators, attributes, concurrent code, sequential code, structural description.
2. VHDL Design and Simulation:
   Design of combinational logic, design of sequential logic, hierarchical design, simulation of digital circuits, creating a test bench.
3. Programmable digital circuits:
   Digital circuit implementation approaches, fundamentals of programmable logic (SPLD,CPLD, FPGA), basic FPGA architectures, modern System on Chip FPGAs.
4. System- and High-Level Design Methodologies:
   Schematic entry vs. HDL entry, IP core based design, arithmetic circuits, clock management, use of embedded sub-systems, high level design based on Matlab/Simulink, aspects of HW/SW co-design.

Laboratory Exercises

1. Familiarization with the Xilinx ISE® Design Suite and the Virtex 5 FPGA development Board.
2. Design and Simulation of combinational logic and sequential logic.
3. FPGA-Implementation of a switch debouncer circuit including timing analysis, Pin-Assignment and programming of the Virtex 5 chip.
4. Use of embedded FPGA sub-systems to process different clock signals.
5. High-Level Design and simulation of a Direct Digital Synthesizer using the Core Generator of Xilinx ISE® Design Suite.

Control Technology

Department	Faculty „Electrical Engineering and Information Technology“
Coordinator	Professor Dr. Michael Lux
Catalog Description	This is an introductory course presenting the fundamentals of feedback control including description of Plants. Simulation techniques (Matlab/Simulink) are applied during the course.
Prerequisites	Basic knowledge of Laplace transform and differential equations
Class Schedule	per week: 4 periods (45 min) + additional time (1 hour) to complete lab exercises
Textbook	Own textbook (in English) is provided
Credits	4

Relationship to Program Educational Objectives

1. Students receive a short theoretical overview of mathematical system description as refreshment and based on existing knowledge (see prerequisites).

2. Theoretical system knowledge is expanded by more detailed and realistic applications, mainly addressing automotive industry problems.

3. Students learn the essentials of linear control theory. The stability problem is addressed. Theory is minimised by restriction to simple control loops with PI controllers and Bode plot with phase margin as design criterion.

4. Students assess their own learning success while applying the contents of the course at the end within a complete application example. They have to solve a complex control problem and run through the design steps
   - problem description,
   - definition of control goals,
   - plant description, plant simulation,
   - design of control architecture,
   - parameter calculation for the controller,
   - verification of the control loop performance.

Course Learning Objectives

Students who receive credit will have demonstrated the ability to do the following tasks.

1. Describe dynamical systems by differential equations
2. Visualise mathematical models as signal flow diagrams and design Matlab/Simulink models
3. Convert ODE description to transfer Functions
4. Select a linear controller and implement it as analogue or digital device
5. Design the control loop
6. Apply Nyquist criterion in order to ensure control loop stability
7. Calculate phase margin of open loop
8. Simulate and verify the design result

Topics

1. Introduction to the control problem, control loop performance assessment
2. System Theory and Plants
   - 2.1 Mathematical Models of Systems
   - 2.2 Frequency Features of Systems
   - 2.3 System graph and Simulation
   - 2.4 Selected Plants
3. Controller and Control Loop
   - 3.1 Controller Tasks
   - 3.2 Controller Architecture
   - 3.3 Controller Types and Implementation
   - 3.4 The Control Loop
   - 3.5 Stability of the Closed Loop
4. A Complete Application

Laboratory Exercises

1. Demo Exercises with different Plants in the Control Lab
2. Familiarisation with Matlab/Simulink
   Simulation of simple system's step response
3. Simulation of a DC drive
4. Drawing Bode Diagrams with Matlab
5. Simulation of a Spindle Drive Position Control Loop
6. (optional) Realization of a Turn Rate Control Loop with an Analogue Controller

Advanced Project Work

Department	Faculty „Electrical Engineering and Information Technology“
Coordinator	Professor of Faculty
Catalog Description	This is an interdisciplinary engineering project including project planning, reporting and presentation
Prerequisites	Knowledge of electrical engineering basics
Class Schedule	per week: 6 periods, 45 min each (minimum)
Textbook	not applicable
Credits	4

Relationship to Program Educational Objectives and Course Learning Objectives

1. Students apply their electrical engineering knowledge with a “real life” or “Lab based” engineering problem.
2. Students learn to define such a problem and to describe it as first part of their project report.
3. Students learn to plan a project, i.e. to break down the problem description to working packages and to set up a project time table.
4. Students solve the technical problem. Applicable literature is to be evaluated and often a Web-investigation is to be performed.
5. Students provide a report about their project and give a presentation, using standard presentation techniques like PowerPoint.
6. An oral test gives the students the opportunity to maintain their project results.

Course Learning Objectives

Students who receive credit will have demonstrated the ability to do the following tasks.

1. Organize a project plan in cooperation with a project partner.
2. Make a literature or web investigation of the state-of-the-art technology.
3. Carry out a project according to a project plan.
4. Write intermediate reports and a final technical report.
5. Give a technical presentation in front of an auditorium.

Topics

The following general topics have to be fulfilled during the course

1. Problem description and analysis
2. Literature and/or Web investigation
3. Discussion of project features with supervisors
4. Realisation of the project in teamwork
5. Technical report
6. Technical presentation
7. Oral Test

Typical projects are:

- Analysis of a control problem, design of a control architecture
- Development of a sensor concept
- Simulation and design of microelectronic circuits
- Development of a computer-controlled test program
- Evaluation of system measurements

Laboratory Exercises

Not applicable

Germany In The Last Three Centuries

Department	Computer Science
Coordinator	Professor Dr. Klaus Peter Kratzer
Catalog Description	German history up to and including reformation and the Thirty Years War; culture, society, and political developments in the 18th century; reform and liberation; German federation; revolution in 1848; Bismarck and his struggle for Prussian hegemony; the German Empire & the 1st World War; the Weimar Republic; Nazi Germany & the 2nd World War; the aftermath of the wars; detente and German reunification
Prerequisites	None
Class/Lab Schedule	Four class periods per week
Textbook	Martin Kitchen: *Cambridge Illustrated History of Germany*, Cambridge University Press, Cambridge 1996
Other Materials	Numerous source materials (print, audio, video) in English or in English translation (to be distributed in class)
Credits	Liberal Studies: 4 credits

Relationship to Program Educational Objectives
Similar to other LS courses

Topics

1. An Overview of German history up to and including reformation and the Thirty Years War.
2. Culture, society, and political developments in the 18th century. The rise of Prussia. The impact of the French revolution.
3. Reform and liberation. German federation. German nationalism in the 19th century as expressed in music and literature.
4. Revolution in 1848. Bismarck and his struggle for Prussian hegemony.
5. The German Empire & the 1st World War. The foundation of the Reich. Bismarck's domestic policy. Colonial policy. The culture of the Wilhelmine Empire. Crises and naval building. The 1st World War.
6. The Weimar Republic. Foundation of the Republic. The Versailles Treaty. Crises & fulfillment. The collapse of the republic.
7. Nazi Germany & the 2nd World War. The pseudo-democratic establishment and consolidation of the Nazi state. Social life and economic policy. The 2nd World War. Concentration camps and the Holocaust. The collapse of Nazi Germany.

8. The aftermath of the wars. Germany under occupation. The Iron Curtain. The foundation of the Federal Republic and the German Democratic Republic. Integration in different systems of alliances.
9. Detente and German reunification. The economic miracle in West Germany. West Germany's "east policy". The collapse of East Germany. Reunification and consolidation.

Course Learning Objectives

Each student who receives credit for this course will have demonstrated the ability to do all of the tasks listed below:

1. Describe and explain the political developments in and around Germany for the period under discussion
2. Describe and explain the socio-cultural evolution in Germany for the period under discussion
3. Explain the development of the German political system
4. Explain attitudes and customs in present-day Germany from an historical viewpoint

German Language

Department	Institute for Foreign Languages and Management
Coordinator	Professor Dr. Ben Dippe
Catalog Description	see below, German classes are mandatory for participants of the program
Textbook	Menschen: Deutsch als Fremdsprache - Kursbuch, Hueber-Verlag Menschen: Deutsch als Fremdsprache – Arbeitsbuch, Hueber-Verlag Supplementary material provided by course coordinator
Credits	2, 3 or 5 credits

Intensive Course in March (voluntary)

German Intensive Course	Lessons per week	Credits
Beginner Level 1 (A1.1)	30 (5 x 6 lessons, 2 weeks)	2
Ankommen in Deutschland, Language and Culture (Previous knowledge of A2 required)	30 (5 x 6 lessons, 1 week)	2

Language Courses during term

German as a Foreign Language	Lessons per week	Credits
Beginner Level 1 (A1.1)	8	2
Beginner Level 2 (A1.2)	4	3
Elementary Level 1 (A 2.1)	4	5
Elementary Level 1 (A 2.2)	4	5
Intermediate Level 1 (B1.1)	4	5
Intermediate Level 2 (B1.2)	4	5

Goals:	The courses will provide competence in speaking, reading and writing German according to the respective level of the Common European Framework (CEFR).
Evaluation:	Written exam (and course participation where applicable)

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