

Hochschule Ulm



Student Exchange Program  
Spring 2014

I.E.E.P.

International Electrical Engineering Program

Hochschule Ulm  
Ulm University of Applied Sciences

Program Coordinator:

Prof. Dipl.-Phys. Gerhard Forster  
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August 2013



## 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)

Arrival: **March 3<sup>rd</sup>, 2014, 9:00 a.m. – 3:00 p.m.**  
 Registration and orientation: **March 4<sup>th</sup>, 2014, 9:30 a.m.**  
 Campus Prittwitzstraße 10, Room B 115  
 Intensive German class: **March 5<sup>th</sup> - March 20<sup>th</sup>, 2014**

**Please arrange your arrival on March 3<sup>rd</sup> between 9:00 a.m. and 3:00 p.m.**

### For students who are not able to arrive in March

Arrival: **April 1<sup>st</sup>, 2014, 9:00 a.m. – 3:00 p.m.**  
 Registration and orientation: **April 2<sup>nd</sup>, 2014, 9:30 a.m.**  
 Campus Prittwitzstraße 10, Room B 115

**Please arrange your arrival on April 1<sup>st</sup> between 9:00 a.m. and 3:00 p.m.**

**Beginning of classes:** April 3<sup>rd</sup>, 2014  
**Breaks:**  
 Easter: April 18<sup>th</sup> - April 21<sup>st</sup>, 2014  
 Labor Day: May 1<sup>st</sup> 2014  
 Ascension Day: May 29<sup>th</sup>, 2014,  
 Pentecost: June 7<sup>th</sup> – June 22<sup>nd</sup> 2014  
 Whit Monday: June 9<sup>th</sup> 2014  
 Corpus Christi: June 19<sup>th</sup> 2014  
**Final exams:** June 23<sup>rd</sup> - June 27<sup>th</sup>, 2014  
**Departure:** June 30<sup>th</sup>, 2014

**Additional project work** July 1<sup>st</sup> - July 30<sup>th</sup>, 2014  
 (4 weeks) optional

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  
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## Application

Every student needs to hand in:

- 4 passport-sized photographs
- Application form Incomings, Housing request form and Application form language course  
Download: <http://www.hs-ulm.de/Internationales/AAA/FormulareDownloads/>
- Resumee
- Proof of valid Health insurance in Germany and Europe (incl. repatriation and evacuation). Please bring the original paper to the International Office after arriving in Ulm
- Valid passport (non US-citizens need an entry visa for Germany)
- Transcript of records
- A document from the home university explaining that the student is still enrolled at the home institution (could be one list for the whole group)

## 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 some equipment for cooking; however we recommend to bring or to buy a small amount of personal kitchenware.

Housing prices are between €240 and €360 per month. Students will be placed by the housing office (Studentenwerk Ulm) on availability basis, unfortunately preferences can not be considered. If you accept the room assigned, you have to sign the contract. A security deposit of EUR 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.

## 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.

### 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 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.

For train connections you can check at [www.bahn.de](http://www.bahn.de).

## 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 €64.50. The Student ID cards will be handed out 1-2 weeks after arrival. For a €5 deposit students will get a plastic ID card. Students registering for the first time as residents in Ulm will be given a free semester ticket (worth €99.50) for public transport. This allows you to take busses and trains in Ulm and its surroundings for free. After the first semester students are allowed to take the city busses in Ulm every evening after 7 p.m. and on Sundays and Holidays free of charge by showing their Student ID card.

## **Please bring the original proof of your health insurance!**

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 Hochschule Ulm. The computer rooms are open from Monday through Friday from 7.30 a.m. until 7 p.m.

## Some more useful information

### For the Fall Term

We recommend bringing winter clothes and also proper clothes for rainy days. In Ulm we face temperatures between 10° Celsius and minus 10° Celsius in the winter. The location of Ulm offers plenty of opportunities to go skiing on a weekend.

If you would like to do so, please bring your skiing equipment. It's also possible to rent skis for those who don't want to bring them along. Ulm has some indoor swimming pools that you can visit, therefore swim clothes might be a good idea for those who enjoy swimming.

### 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.

Living in a student dorm you do not need to bring linens. 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 with some dishes, pots etc. 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 a.m. and close normally at 6.30 p.m. (Saturdays at 6 p.m.) There are some shops that are open until 8 p.m., especially grocery stores. On Sundays every shop is closed.

## Money

You will need a minimum of €670 for living expenses per month. If you like you may open a bank account. 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. Probably the best way to handle money is to take a supply of traveler's checks. Please do not bring large amounts of cash, this is very unsafe.

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 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. It costs once €9.90.

## **Food**

As the 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.

## **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:

12<sup>th</sup> November 2013 = 12.11.2013 (12 = day, 11 = month, 2013 = year)

## **Some safety tips**

Ulm is a safe city in which to live 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)



## Travel tips

We know that some of you like to spend the weekend traveling in small groups. Therefore we have here some proposals. You can reach all these places by train. Many of them belong to the UNESCO world heritage.

### **Bamberg / Germany**

This is one of the most beautiful old towns in Germany. With early gothic cathedral, renaissance places, medieval houses and a lot of typical pubs. Recommended time of visit: 1-1.5 days.

### **Oberstdorf / Mountain Hiking**

With the local train to Oberstdorf, then hiking to the Freibergsee (Lake) and further with the cable car to the summit of the Fellhorn (2000 m). Then to the summit of the Kanzelwand and downhill with another cable car to Riezlern. Back to Oberstdorf by bus, and then the train back to Ulm. Time: 1 day. (Before the end of October as the cable car will be out of operation.)

### **Verona and Venice / Italy**

Verona is the place of Romeo and Julia, with a roman amphitheater and a marvelous medieval town center. Venice is a unique place in the world from the 16<sup>th</sup> and 17<sup>th</sup> century. There is a night train to Verona, and it takes only 2 more hours to Venice. Time: 2 days with night trains.

### **Avignon / France**

The south of France has kept its flair and one can take advantage of the better climate and still sit outside in the cafe. The city was the residence of the catholic popes for some time and the palace is still there. It also has the famous bridge. Maybe you know the song: "Sur le pont de Avignon". Time: 2 days, with night trains.

### **Cinque Terre and the Mediterranean Sea / Italy**

This is a famous "pirate coast" with villages on top of steep cliffs above the Mediterranean Sea. It has no roads but hiking trails, and a small railway connecting the villages. It can be easily reached by train to Genova / Italy and then with a local train direction Rapallo. You need good weather. Time: 2 days, with night trains.

**Lectures**

**Analog Integrated Circuits** (Professor Forster)

**Control Technology** (Professor Schroer)

**Advanced Project Work** (Professors of faculty)

**German History in the last 3 centuries** (Professor Kratzer)

**German Language** (t.b.a.)

Attendance at the lectures is required. Hochschule Ulm can not guarantee that Friday will be free for students.

<b>Analog Integrated Circuits</b>
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<b>Department</b>	Faculty „Electrical Engineering and Information Technology“
<b>Coordinator</b>	Professor Dipl.-Phys. Gerhard Forster
<b>Catalog Description</b>	This is an introductory course presenting the fundamentals of integrated circuit design. This includes the basic fabrication steps of today's VLSI processes as well as the specific circuit technology to be realized in these processes. Exercises are carried out on workstations with state-of-the-art ASIC design software.
<b>Prerequisites</b>	Basic knowledge of electronic devices and transistor models
<b>Class Schedule</b>	per week: 4 periods (45 min) + additional time (1 hour) to complete lab exercises
<b>Textbook</b>	Own manuscript (in English) will be provided
<b>References</b>	P. R. Gray, P. J. Hurst, S. H. Lewis, R. G. Meyer, <i>Analysis and Design of Analog Integrated Circuits</i> , 5 <sup>th</sup> ed. John Wiley and Sons, 2010 A. S. Sedra, K. C. Smith, <i>Microelectronic Circuits</i> , 6 <sup>th</sup> ed. Oxford University Press, 2010
<b>Credits</b>	4

### Relationship to Program Educational Objectives

1. The students receive a thorough introduction to the integrated circuit technology. They get insight in the potential and restrictions in view of the electronic circuit design for monolithic integration. This is important because most of today's circuits have to be designed for integration in microchips.
2. The students get acquainted with basic integrated circuits in Bipolar and CMOS technology. They evaluate their characteristics theoretically using their knowledge in basic devices and device modelling.
3. The students consolidate their knowledge by schematic capture and circuit simulation with the latest industry standard software and hardware tools.
4. A hardware experiment 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 (Cadence Virtuoso® Schematic Editor, Spectre® Simulator, and Virtuoso Layout XL® Layout Editor).
2. Analyse an existing electronic circuit symbolically and using simulation.
3. Choose a suitable basic circuit that fits best to the requirements of a given specification.
4. Make a decision between Bipolar or CMOS processes for circuit realization.
5. Synthesize a circuit topology using basic integrated circuit modules like amplifiers, current sources and output stages.
6. Carry out the sizing using simulation of a synthesized circuit topology.
7. Optimise the synthesized circuit according to specifications of current consumption, impedances and speed.
8. Verify an integrated circuit by electrical tests.

## Topics

1. Integrated Circuit Production Technology:  
Basic steps of fabrication in the planar process, bipolar process, CMOS process, advanced processes. (7 classes)
2. Basic Amplifier Circuits:  
Transfer characteristics of the basic single-transistor stages, Miller approximation for RF, Darlington configuration, cascode configuration, differential amplifier, emitter degeneration. (7 classes)
3. Integrated circuit modules:  
Current sources (bipolar and CMOS), stabilization circuits for voltage and current, amplifiers with active load. (7 classes)
4. Power amplifiers:  
Operating mode and efficiency, class A, class B, and class AB output stages. (7 classes)
5. Overview of practical circuit applications (2 classes)

## Laboratory Exercises

1. Familiarisation with the Cadence Design Suite.  
Schematic capture of basic circuits with Virtuoso.
2. Simulation of transfer characteristics with Spectre.
3. Schematic capture of a differential amplifier and its test bench.
4. Simulation of transfer characteristics, low frequency gain, bandwidth and transient response.
5. Layout design of a CMOS differential amplifier.
6. Inspection of integrated circuits using the microscope.
7. (Depending on remaining time) Measurements of a Gilbert multiplier integrated circuit.

<b>Control Technology</b>
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<b>Department</b>	Faculty „Electrical Engineering and Information Technology“
<b>Coordinator</b>	Professor Dr.-Ing. Wolfgang Schroer
<b>Catalog Description</b>	This is an introductory course presenting the fundamentals of feed back control including description of Plants. Simulation techniques (Matlab/Simulink) are applied during the course.
<b>Prerequisites</b>	Basic knowledge of Laplace transform and differential equations
<b>Class Schedule</b>	per week: 4 periods (45 min) + additional time (1 hour) to complete lab exercises
<b>Textbook</b>	Own textbook (in English) is provided
<b>Credits</b>	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) Realisation of a Turn Rate Control Loop with an Analogue Controller

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

### Relationship to Program Educational Objectives and Course Learning Objectives

1. Students apply their electrical engineering knowledge with a “real life” 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



<b>Germany In The Last Three Centuries</b>
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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 18 <sup>th</sup> century; reform and liberation; German federation; revolution in 1848; Bismarck and his struggle for Prussian hegemony; the German Empire & the 1 <sup>st</sup> World War; the Weimar Republic; Nazi Germany & the 2 <sup>nd</sup> World War; the aftermath of the wars; detente and German reunification
Prerequisites	None
Class/Lab Schedule	Four class periods per week
Textbook	Martin Kitchen: <i>Cambridge Illustrated History of Germany</i> , 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 18<sup>th</sup> century. The rise of Prussia. The impact of the French revolution.
3. Reform and liberation. German federation. German nationalism in the 19<sup>th</sup> century as expressed in music and literature.
4. Revolution in 1848. Bismarck and his struggle for Prussian hegemony.
5. The German Empire & the 1<sup>st</sup> World War. The foundation of the Reich. Bismarck's domestic policy. Colonial policy. The culture of the Wilhelmine empire. Crises and naval building. The 1<sup>st</sup> World War.
6. The Weimar Republic. Foundation of the Republic. The Versailles Treaty. Crises & fulfillment. The collapse of the republic.
7. Nazi Germany & the 2<sup>nd</sup> World War. The pseudo-democratic establishment and consolidation of the Nazi state. Social life and economic policy. The 2<sup>nd</sup> 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

### **Overview of Klaus Peter Kratzer's CV**

- Native German born 04/13/1958 in Nuremberg, Germany
- School education 1964-1976
- Erlangen-Nuremberg University 1976-1981 (diploma in computer science)
- Freelance work for IBM 1978-1981
- Triumph-Adler AG, Nuremberg (local computer manufacturer) 1981-1983
- Erlangen-Nuremberg University 1983-1986 (PhD in computer science)
- IBM Almaden Research Center, San Jose, CA 1987
- Hochschule Ulm CS Dept 1988-present

Lifelong interest in history --- study of numerous textbooks, biographies, and source materials

<b>German Language</b>
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<b>Department</b>	Basic Studies
<b>Coordinator</b>	Ms. Gremer
<b>Catalog Description</b>	see below
<b>Prerequisites</b>	None
<b>Class/Lab Schedule</b>	Six class periods per week
<b>Textbook</b>	Eurolingua Deutsch Band 1, Cornelson
	Supplementary material on German studies provided by course Coordinator
<b>Other Materials</b>	Numerous source materials (print, audio, video) in English or in English translation (to be distributed in class)
<b>Credits</b>	2 or 4 credits

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**Topics:**

This course will provide basic competence in speaking and reading German.

Listening, speaking, understanding

First contacts; shopping; describing the way;

Telephone conversations; biographical details

Writing and Reading

Notes; texts; simple letters; price lists; use of dictionaries;

Advertisements; poems

Grammar will include

definite and indefinite articles; singular and plural; conjugation of verbs; separable verbs; tenses; prepositions with dative and accusative

At the end of the course students have to sit an examination.