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ICEP – INTERNATIONAL COMPUTER ENGINEERING PROGRAM

Technische Hochschule Ulm
University of Applied Sciences

ICEP - International Computer Science and Computer 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 Technische Hochschule Ulm for an additional month to work on a project in one of the university's laboratories. For more information, please get in touch with one of your professors of the regular ICEP classes.

Coordination

Faculty of Computer Science

Prof. Dr. Klaus Peter Kratzer
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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 some equipment for cooking; however 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 three to four 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 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 your 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)

ICEP 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.

ICEP Course at Technische Hochschule Ulm	Member of the Faculty	Credits
Information Security Management	Prof. Dr. Markus Schäffter	4
Computer Architecture	Prof. Dr. Manfred Strahnen	4
Computer Networks	Prof. Dr. Markus Schäffter	4
Machine Vision	Prof. Dr. Herbert Frey	4
Operating Systems	Prof. Dr. Joachim Hering Prof. Dr. Stefan Traub	4
Germany In The Last Three Centuries	Prof. Dr. Klaus Peter Kratzer	4
German Language	Prof. Dr. Ben Dippe	2 / 3 / 5

Attendance is required.

Information Security Management

Department	Computer Science
Coordinators	Professor Dr. Markus Schäffter
Catalog Description	Information Security targets; network and application security, typical threats and vulnerabilities, risk management, Information Security Management Systems (IMS) based on ISO 27000, case studies in automotive, e-health, and smart grid power suppliers.
Prerequisites	Operating Systems I, Distributed Systems
Class/Lab Schedule	Four class periods per week
Textbook	Blackout - Tomorrow Will Be Too Late, Marc Elsberg; Implementing the ISO/IEC 27001 ISMS Standard, Ted Humphreys.
Other Materials	ISO 27001; ISO 27002; ISO 27799; ISO 27019.
Credits	Computer Science/Computer Engineering: 4 credits

Relationship to Program Educational Objectives

This course contributes to students' achievement of the Computer Science Program Educational Objectives as outlined below:

Objective 1: Due to ACM and IEEE-CS, the need for Information Security is one of the fastest growing issues in modern Information Technology (IT). Information Security is a multifaceted field that includes both technical and behavioral components.

Objective 2: Analysis of threads and vulnerabilities increases the depth of knowledge in information technology and enables students to oversee the risks associated with new functionality and technologies in information systems.

Objective 3: Students will work in small, interdisciplinary teams during the case studies.

Objective 4: The class and case studies provide skills in planning and operating management systems in general and in Information Security in particular.

Topics

1. Information Security terminology: Security targets, threads, vulnerabilities, risks, security controls, management systems.
2. Introduction in the Information Security Management Systems (ISMS) based on the standards family ISO 27000.
3. Set up of typical Information Security Management Systems, including organization, policies, and guidelines.
4. Identification, assessment, and treatment of typical risks in information systems.

5. Typical security measures in distributed information systems, in particular in web based systems.
6. Students' presentations of specific areas in information security such as malware control, firewalls, systems hardening, encryption technologies, cyberwar, cybersecurity, auditing and reviewing information security, business continuity management, Darknet, network security, etc.

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. Explain the inherent threats and vulnerabilities in distributed information systems.
2. Identify and estimate technical risks for operating information systems.
3. Derive appropriate and effective security measurements to reduce IT related risks.
4. Planning an Information Security Management System based on ISO 27001.
5. Classifying security measures based on ISO 27002.
6. Extend an Information Security Management System for critical infrastructures based on the respective ISO standards.
7. Work in small teams on specific aspects of Information Security and present the results to others.

Computer Architecture

Department	Computer Science
Coordinators	Professor Dr. Manfred Strahnen
Catalog Description	The fundamental concepts in computer architecture and organization are presented. Topics include arithmetic logic unit design, control unit design, memory and cache organization, input/output and peripheral buses, pipelining, RISC-architectures and parallel processing. Laboratory assignments using VHDL simulation are an essential part of the course. Examples of advanced computer architecture are presented.
Prerequisites	CE-210, Digital Systems I CE-320, Microcomputers I
Class/Lab Schedule	Three class periods and two lab periods per week
Textbook	William Stallings, *Computer Organization and Architecture,* Prentice-Hall , 2000
Other Materials	handouts to be distributed
Credits	Computer Science/Computer Engineering: 4 credits

Relationship to Program Educational Objectives

This course contributes to students' achievement of the Computer Science Program Educational Objectives as outlined below:

Objective 1: Students are introduced to the principles of architecture and organization of computers as well as to advanced architecture concepts.

Objective 2: Students are introduced to the design and simulation of computers, using VHDL.

Objective 3: The course gives the student an understanding of state of the art computers.

Objective 4: During the last weeks of the term, students work in teams on a project. Each team designs a specific simple computer and tests it by simulation.

Objective 5: The course prepares the student for self-learning, graduate work and technical projects in computer architecture.

Topics

1. Review of digital Systems
2. Introduction to computer architecture
3. VHDL modeling
4. Arithmetic operations on integers and their implementation
5. Floating point arithmetic
6. Addressing modes and instruction set
7. Control unit, hardwired and microprogrammed
8. Interrupts and exceptions
9. Advanced memory organization
10. Cache principles and design
11. Input/output and peripheral bus systems
12. Pipelining and RISC-architecture
13. MIMD-class computers

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. State the function of each unit in a typical computer system
2. Design a simple arithmetic logic unit
3. Write the algorithms for implementation of arithmetic operations on integers
4. Understand the representation of floating point numbers (IEEE 754)
5. Analyze and specify the instruction set for a small computer
6. Design a simple control unit for a computer
7. Write a VHDL model of a small computer
8. Debug a VHDL model
9. Analyze the results of a VHDL simulation
10. Understand the structure of cache-memory systems
11. Understand the principles of input/output and peripheral bus systems
12. Analyze the function RISC- and MIMD-Computers

Computer Networks

Department	Computer Science
Coordinator	Professor Dr. Markus Schäffter
Catalog Description	Organization and Programming of Computer Networks
Prerequisites	CS-202, Systems Programming Concepts CE-320, Microcomputers
Class/Lab Schedule	Three class periods and one 90-minute lab period per week
Textbook	A. Tanenbaum, Computer Networks, Third Edition, Prentice Hall, 1996
Other Materials	Separate books or web-pages supporting the programming exercises
Credits	Computer Science/Computer Engineering: 4 credits

Relationship to Program Educational Objectives

This course contributes to students' achievement of the Computer Science Program Educational Objectives as outlined below:

Objective 1: Computer Networks become a major part in the design of software systems. The internet technology is more and more integrated into most computer applications. The course prepares students for the construction, design and programming of interconnected computer systems.

Objective 2: Students work in teams on a project assignment, developing further their technical projects.

Objective 3: This course provides a broad technical experience required to analyze and the design of computer networks and supporting software infrastructure.

Objective 4: The opportunity for self-directed projects on topics for personal interests develops the students' ability for self-directed study using modern media like the internet.

Topics

1. The ISO/OSI-Model
2. The physical layer (media types)
3. Data link layer protocols (Ethernet, token, ppp)
4. Networking layer (addressing, routing, flow control)
5. Interconnection Components (Hubs, Switches, Router, Gateways)
6. The Internet-Protocol suite (IP, TCP, UDP)
7. TCP/IP Supporting Protocols (ARP, ICMP, RIP)
8. Application Layer Protocols (SMTP, HTTP, POP, SNMP, HTTP)
9. Naming and Directory Systems (DNS, NDS, Active-Directory)
10. The Socket Programming Interface
11. Higher Layer API's (RPC, DCOM, Corba)
12. Security issues (attacks, firewalls, encryption)

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 the function of each layer in the OSI (or TCP/IP) model.
2. Explain the characteristics of several types of physical media.
3. Understand the "multiple access" problem of LAN's.
4. Has information about internet-addresses and routing problems.
5. Can build a network infrastructure using hubs, switches and router.
6. Has the knowledge of setting-up the ip network configuration (unix, windows)
7. Knows the difference of connection-oriented and connectionless protocols.
8. Describe several application protocols.
9. Knows how to use naming-systems (DNS).
10. Can send network-packets using the socket interface.
11. Has knowledge about using DCOM and Corba.
12. Is able to setup and configure a firewall (linux).

Machine Vision

Department	Computer Science
Coordinator	Professor Dr. Herbert Frey
Catalog Description	The principles and methods of machine vision. Camera techniques, illumination, optics, calibration, frame grabber, image processing, filters, segmentation, binary image processing, feature extraction, classification.
Prerequisites	CS-101 Computing & Algorithms I CS-102 Computing & Algorithms II
Class/Lab Schedule	Three 60-minutes class periods and one 60-minute lab period per week
Textbook	Ramesh Jain, Rangachar Kasturi and Brian G. Schunck, *Machine Vision*, McGraw-Hill, 1995
Other Materials	None
Credits	Computer Science: 4 credits

Relationship to Program Educational Objectives

This course contributes to students' achievement of the Computer Science Program Educational Objectives as outlined below:

Objective 1: The ability to analyze a machine vision problem and to design a suitable system. This includes the selection of hardware components as well as the selection of methods and tools.
Objective 2: Students will gain the ability to describe and solve machine vision problems.
Objective 3: The course will gain students ability to work on interdisciplinary projects.
Objective 4: The course incorporates a hand-on laboratory experience on machine vision including programming machine vision techniques in C++.

Topics

1. Introduction
2. Binary Image Processing
3. Regions
4. Image Filtering
5. Edge Detection
6. Contours
7. Optics
8. Color
9. Calibration
10. Object Recognition

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. Design a machine vision system: camera, optics, illumination, frame grabber.
2. Describe the image formation process in a camera.
3. Choose (and defend) the appropriate method to apply to a given machine vision problem.
4. Describe the fundamental concepts of filtering.
5. Apply image processing techniques to image material.

Operating Systems

Department	Computer Science
Coordinators	Professor Dr. Joachim Hering Professor Dr. Stefan Traub
Catalog Description	Operating system function and implementation; process and thread management, scheduling and synchronization; deadlock; real and virtual memory management, file-system structure and implementation. Case studies of historical and modern operating systems.
Prerequisites	CS-202, Systems Programming Concepts; CE-320, Microcomputers I
Class/Lab Schedule	Three class periods and one 90-minute lab period per week
Textbook	Abraham Silberschatz and Peter Baer Galvin, *Operating System Concepts,* Addison-Wesley, 1998
Other Materials	Linux manuals, source code handouts (to be distributed in the lab)
Credits	Computer Science/Computer Engineering: 4 credits

Relationship to Program Educational Objectives

This course contributes to students' achievement of the Computer Science Program Educational Objectives as outlined below:

Objective 1: Operating systems is recognized by the ACM and IEEE-CS as a fundamental area of computer science. Material presented in this course prepares a student to continue work in several different systems areas of computer science. Modern programming techniques involving multitasking and thread programming are presented.

Objective 2: Analysis of working operating system code in the laboratory provides depth of knowledge in operating systems.

Objective 3: Students will work in small, interdisciplinary teams during the laboratory sessions.

Objective 4: The class and laboratory provide hands-on experience in a modern and high demand discipline.

Topics

1. Operating system terminology. History of operating systems; overview of parallel, distributed and real-time operating systems.
2. Overview of computer architecture. Hardware and operating systems.
3. Processes and threads. Process scheduling. Interprocess communication.
4. CPU scheduling and algorithms. Multi-processor and real-time scheduling.
5. Process synchronization. Semaphores. Classical problems of synchronization.
6. Deadlock: characterization, prevention, avoidance, detection and recovery.
7. Memory management. Swapping, contiguous allocation, paging and segmentation.
8. Virtual memory. Demand paging. Page replacement and frame allocation. Thrashing. Demand segmentation.
9. Files and directory structure. Consistency semantics.
10. File-system implementation.

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. Give the basic structure of an operating system, and explain the purpose of each part.
2. Explain the relevance of architectural features to an operating system.
3. Discuss the history of operating systems, listing features of important systems.
4. Explain the process state diagram and the process control block.
5. Write code to implement context switching, job and CPU scheduling.
6. Write code to solve the classical problems of synchronization, using semaphores.
7. Implement critical regions and/or monitors using semaphores.
8. Describe algorithms for deadlock prevention, deadlock avoidance and deadlock recovery.
9. Describe algorithms for physical memory management, including swapping, contiguous allocation, paging, segmentation and paged segmentation.
10. Evaluate page-replacement algorithms in a demand paging environment, including discover and correction of thrashing.
11. Describe the directory structure in a modern operating system.

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 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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