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|  |  | **ECTS Course Description Form** |
|  | **PART I ( Senate Approval)** |
|  | **Offering School**  | Engineering |
|  | **Offering Department** | Computer Engineering |
|  | **Program(s) Offered to** | Computer Engineering |  |
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|  | **Course Code**  | CS222 |
|  | **Course Name** | Computer Organization and Architecture |
|  | **Language of Instruction** | English |
|  | **Type of Course** | Lecture and lab work |
|  | **Level of Course** | Undergrad |
|  | **Hours per Week** | **Lecture: 3** | **Laboratory:** | **Recitation:**  | **Practical:**  | **Studio:** | **Other:** |
|  | **ECTS Credit** | **7** |
|  | **Grading Mode** | Letter grade |
|  | **Pre-requisites** | EE221 and EE221L  |
|  | **Co-requisites** | **-** |
|  | **Registration Restriction** | - |
|  | **Educational Objective** | This course teaches the students the basic hardware components of a computer and how they interact. It teaches them the various levels of the computer, including the application level, operating system level, assembly language level, and machine language level. |
|  | **Course Description** | The main goal of this course is to outline the architectural side of computers. In other words, it focuses on how computers-as machines- execute instructions at various levels, including the hardware level and assembly language level. The students learn the basic technological structure and evolution of computers, fundamental hardware components, instructions set architectures (specifically MIPS and x86) together with their assembly languages, the microarchitecture of a processor including the control unit (MIPS is given as an example), memory hierarchy, storage and input/output.  |
|  |  | **LO1:** Identify the hardware components of a computer system and explain how machine instructions and the data they operate on are represented, stored, and executed. |  |
|  | **Learning Outcomes**  | **LO2:** Explain the roles of the OS, compiler, assembler, loader, and linker and how subroutines are commonly linked and executed |  |
|  | **LO3**: Identify the basic components of an instruction-set architecture and explain the differences between machine programming models. |
|  | **LO4:** Identify the factors affecting execution performance and measure the impact of various architectural implementation strategies on performance. |
|  | **LO5:** Explain the principle of pipelining and the interdependencies between pipelining and instruction set design. |
|  | **LO6**: Identify the main components of the memory hierarchy and explain how caches increase the apparent speed of memory. |
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|  | **PART II ( Faculty Board Approval)** |
|  | **Basic Outcomes (University-wide)** | **No.** | **Program Outcomes** | **LO1** | **LO2** | **LO3** | **LO4** | **LO5** | **LO6** |
|  | **PO1** | **Ability** to communicate effectively and write and present a report in Turkish and English.  | 0 | 2 | 0 | 0 | 0 | 0 |
|  | **PO2** | **Ability** to work individually, and in intra-disciplinary and multi-disciplinary teams. | 0 | 0 | 0 | 0 | 0 | 0 |
|  | **PO3** | **Recognition** of the need for life-long learning and **ability** to access information , follow developments in science and technology, and continually reinvent oneself. | 0 | 2 | 0 | 0 | 0 | 0 |
|  | **PO4** | **Knowledge** of project management, risk management, innovation and change management, entrepreneurship, and sustainable development. | 0 | 0 | 0 | 0 | 0 | 0 |
|  | **PO5** | **Awareness** of sectors and **ability** to prepare a business plan. | 0 | 0 | 0 | 0 | 0 | 0 |
|  | **PO6** | **Understanding** of professional and ethical responsibility and **demonstrating** ethical behavior. | 0 | 0 | 0 | 0 | 0 | 0 |
|  | **Faculty Specific Outcomes** | **PO7** | **Ability** to define complex engineeringproblems, develop models andimplement solutions for theseproblems | 2 | 0 | 2 | 2 | 0 | 2 |
|  | **PO8** | **Ability** to conduct lab experiments by usingcomputers and the ability of collecting, analyzing and interpreting data.  | 2 | 0 | 2 | 2 | 0 | 2 |
|  | **PO9** | **Ability** to apply the knowledge ofmathematics, science and engineeringprinciples to solve problems in computerengineering. | 2 | 0 | 2 | 2 | 1 | 2 |
|  | **PO10** | An **understanding** of current contemporaryissues and impact of engineering solutionsin legal and ethical levels | 0 | 0 | 0 | 0 | 0 | 0 |
|  | **PO11** | **Ability** to understand and apply discretemathematics concepts. | 0 | 0 | 0 | 0 | 0 | 0 |
|  | **PO12** | **Ability** to use modern engineeringtechniques, tools and informationtechnologies and develop softwareequipment and software. | 2 | 1 | 2 | 2 | 1 | 2 |
|  |  | **PO13** | **Ability** to analyze, design and manage thehardware/software computer systemrequirements with limited resources andconditions by modern engineeringprinciples. | 2 | 2 | 2 | 2 | 2 | 2 |
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| **PART III ( Department Board Approval)** |
| **Course Subjects, Contribution of Course Subjects to Learning Outcomes, and Methods for Assessing Learning of Course Subjects** | **Subjects** | **Week** |  | **LO1** | **LO2** | **LO3** | **LO4** | **LO5** | **LO6** |
| **S1** | 1 | Introduction to Computer architecture, History of computers  | A1/3 |  |  |  |  |  |
| **S2** | 2 | Top-level view of computer function, digital logic  | A1/3 |  |  |  | A1/3 | A1/3 |
| **S3** | 3 | Digital logic  | A1/3/8 |  |  |  |  |  |
| **S4** | 4 | Number systems, computer arithmetic  | A1/3 |  |  |  |  |  |
| **S5** | 5 | Instruction sets: characteristics and functions  |  | A1/3 | A1/3 | A1/3 |  |  |
| **S6** | 6 | Instruction sets: addressing modes and formats  |  | A1/3 | A1/3 | A1/3 |  |  |
| **S7** | 7,8 | Instruction sets: MIPS  |  | A1/3 | A1/3 | A1/3 |  |  |
| **S8** | 9 | Processor structure and function  | A1/3 |  |  | A1/3 | A1/3 | A1/3 |
| **S9** | 10,11 | RISC processor  | A1/3 |  | A1/3 | A1/3 | A1/3 | A1/3 |
| **S10** | 12,13 | Memory architecture  | A1/3 | A1/3 |  | A1/3 |  | A1/3 |
| **S11** | 14 | I/O, storage  | A1/3 | A1/3 |  | A1/3 |  | A1/3 |
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| **Assessment Methods, Weight in Course Grade, Implementation and Make-Up Rules**  | **No.** | **Type** | **Weight** | **Implementation Rule** | **Make-Up Rule** |
| **A1** | **Exam** | *60%* | *Midterm is 25% and final is 35% of the final mark.* | A make-up exam is provided in case of a legitimate reason with a proof. |
| **A2** | **Quiz** | *15%* | *At least three quizzes are taken* | No make-up |
| **A3** | **Homework** | *25%* | *At least four assignments are submitted.* | No make-up |
| **A4** | **Project** |  | - | - |
| **A5** | **Report** |  | - | - |
| **A6** | **Presentation** |  | - | - |
| **A7** | **Attendance/ Interaction** |  | - | - |
| **A8** | **Class/Lab./****Field Work** |  | - | - |
| **A9** | **Other** |  | - | - |
| **TOTAL** | **100%** |
| **Evidence of Achievement of Learning Outcomes** | Students will demonstrate learning outcomes through midterm exams, homework assignments, and the final exam. Every topic is tested with at least one exam or homework question. In order to pass, a student needs to accumulate at least 50 % of the total mark. |
| **Method for Determining Letter Grade** | The total mark is converted to a letter grade using the table below.

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| **Total points** | 100-95 | 94-90 | 89-85 | 84-80 | 79-75 | 74-70 | 69-65 | 64-60 | 59-55 | 54-50 |
| **Letter Grade** | A | A- | B+ | B | B- | C+ | C | C- | D+ | D |

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| **Teaching Methods, Student Work Load** | **No** | **Method** | **Explanation** | **Hours** |
| ***Time applied by instructor*** |
| **1** | **Lecture** | Lectures are given using the white board with the help of power point slides. Whenever necessary, numerical examples and sample questions are given to clarify theoretical concepts.  | 3X14 = 42 |
| **2** | **Interactive Lecture** |  |  |
| **3** | **Recitation** |  |  |
| **4** | **Laboratory** |  |  |
| **5** | **Practical** |  |  |
| **6** | **Field Work** |  |  |
| ***Time expected to be allocated by student*** |
| **7** | **Project** |  |  |
| **8** | **Homework** | The students get the solution to homework questions after submission. | 4\*8 = 32 |
| **9** | **Pre-class Learning of Course Material**  |  |  |
| **10** | **Review of Course Material** | Review is conducted at the end of every chapter or module. Students are asked to be ready for review sessions. | 5\*12 = 60 |
| **11** | **Studio** |  |  |
| **12** | **Office Hour** | Two hours per week is allocated for students’ questions. In addition, students can arrange for a meeting at any time. | 3\*14 = 42 |
| **TOTAL** |  |
| **IV. PART** |
| **Instructor** | **Name** | Shahram Taheri |
| **E-mail** | Shahram.taheri@antalya.edu.tr |
| **Phone Number** | *05519527217* |
| **Office Number** | *A1-19* |
| **Office Hours** | *TBA* |
| **Course Materials** | **Mandatory** | * Computer Organization and Architecture, 9th Edition, *William Stallings,* Pearson

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| **Recommended** | * Computer Organization and Design, 4th Edition, John L. Hennessy, David A. Patterson, Morgan Kaufmann
 |
| **Other** | **Scholastic Honesty** | Violations of scholastic honesty include, but are not limited to cheating, plagiarizing,fabricating information or citations, facilitating acts of dishonesty by others, havingunauthorized possession of examinations, submitting work of another person or workpreviously used without informing the instructor, or tampering with the academic work of other students. Any for of scholastic dishonesty is a serious academic violation and will result in a disciplinary action. |
| **Students with Disabilities** | Reasonable accommodations will be made for students with verifiable disabilities. |
| **Safety Issues**  | - |
| **Flexibility** | The level of detail can be made more in-depth or can be reduced depending on the students interests and time availability. |