**ITU**

**DERS KATALOG FORMU**

**(Course Catalogue Form)**

| **Dersin Adı:**  Mikroişlemci Sistemleri | **Course Name:**  Microprocessor Systems |
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| **Kodu (Course Code)** | **Yarıyıl (Semester)** | **Kredisi (Local Credits)** | **AKTS Kredisi (ECTS Credits)** | **Ders Uygulaması, Saat/Hafta** | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Ders (Theoretical)** | **Uygulama (Tutorial/Recitation)** | **Laboratuvar (Laboratory)** |
| BLG212E | 5 | 3 | 6 | 3 | - | - |

| **Bölüm/Program**  **(Department/Program)** | Bilgisayar Mühendisliği / Computer Engineering |
| --- | --- |

| **Dersin Türü**  **(Course Type)** | Mühendislik Tasarım  (Engineering Design) | **Dersin Dili (Course Language)** | İngilizce  (English) |
| --- | --- | --- | --- |
| **Ders Zorunluluğu (Course Compulsion)** | | Zorunlu (Compulsory) | |

| **Dersin Önkoşulları (Course Prerequisites)** | BLG231/E Digital Circuits  or  EHB205/E Introduction to Logic Design | | | |
| --- | --- | --- | --- | --- |
| **Dersin Mesleki Bileşene Yüzde Katkısı**  **(Course Category by Content Percentage)** | Temel Bilim  (Basic Science) | Temel Mühendislik (Engineering Science) | Mühendislik Tasarım (Engineering Design) | İnsan ve Toplum Bilim (General Education) |
| - | 25% | 75% | - |

| **Dersin İçeriği (Course Description)** | Bilgisayar ve mikroişlemci tabanlı sistemlere giriş dersidir. Ders, sayı sistemleri ve ikili değer aritmetiği, bellek ve bellek genişletme, Merkezi İşlem Birimi mimarisi, adresleme yöntemleri, genel mikroişlemciler ve mimarileri, adresleme türleri ve komut kümeleri, Giriş/Çıkış: paralel ve seri G/Ç aygıtları, çevre birimleri, alt yordam, kesme ve yığın yapıları, veri transferi, Assembly dili ve komutları, mikroişlemci tabanlı sistem tasarımı gibi konuları kapsamaktadır. |
| --- | --- |
| Introduction to computer and microprocessor-based systems. Number systems, binary arithmetic and data representation. Memory and memory expansion. CPU architecture. Addressing methods. A generic microprocessor and its architecture. Addressing modes and instructions set. Input/Output: parallel and serial I/O devices. Peripheral devices. Subroutine, interrupt and stack structure. Data transfer. The assembly language and directives. Design of a microprocessor-based system. |
| **Dersin Amacı (Course Objective)** | 1. Sayı sistemleri ve bilgisayarda veri temsilini anlamak. 2. Bilgisayar mimarisini tanımlamak ve ana hatlarını belirlemek. 3. Bellek ve bellek tasarımı. 4. Merkezi İşlem Birimi’nin mimarisi. 5. Adresleme yöntemleri ve komut kümeleri. 6. Arayüz oluşturma ilkelerini belirlemek. 7. Mikroişlemcilerde programlama kavramlarını açıklamak. 8. Bazı popüler mikroişlemciler hakkında temel bilgi edinimi. |
| 1. to understand number systems and data representation in computer. 2. to idendify and outline the architecture of computers. 3. Memory and memory design. 4. Architecture of CPU. 5. Adressing methods and generic instructions set. 6. to describe the principles of interfacing. 7. to explain the programming concepts for microprocessors. 8. to have a basic knowledge of some popular microprocessors. |
| **Dersin Öğrenme Çıktıları (Course Learning Outcomes)** | 1. Bilgisayarda veri simgeleme hakkında temel bilgi edinme. 2. Bellek ve bellek tasarımını anlama. 3. Merkezi İşlem Birimi, adresleme yöntemleri ve komut kümelerini tanımlamak. 4. Assemly programlamayı tanımlamak. 5. Giriş/Çıkış arayüzü ve tasarımı. 6. Yığın işlemlerini, alt yordam ve kesme hizmet programını anlamak. 7. Mikroişlemci tabanlı sistemlerin yapısını tanımlamak. 8. Mikroişlemciler kullanılarak dijital sistem analizi ve tasarımı. |
| 1. Have basic knowledge of data representation in computer. 2. Understand of memory and memory design. 3. Identify CPU, addressing methods and instruction set. 4. Idendify the assembly programming. 5. Input/output interface and design 6. Understand the stack operation, subprogram and interrupt service routine. 7. Identify the structure of microprocessor-based systems. 8. Analyse and design a digital system by using of microprocessors. |

| **Ders Kitabı (Textbook)** | Alexander G. Dean, Embedded Systems Fundamentals with Arm Cortex M based  Microcontrollers: A Practical Approach, Arm Education Media, 2017 |
| --- | --- |
| **Diğer Kaynaklar (Other References)** | Gene H.Miller, Microcomputer Engineering, 3rd Edition, Pearson, 2003  Esref Adalı, “Mikroişlemciler Mikrobilgisayarlar”, Birsen Yayınevi, 1997. |

| **Ödevler ve Projeler (Homeworks & Projects)** | 2 Ödev |
| --- | --- |
| 2 Homeworks |
| **Laboratuvar Uygulamaları (Laboratory Work)** | - |
| - |
| **Bilgisayar Kullanımı (Computer Use)** | - |
| - |
| **Diğer Uygulamalar (Other Activities)** | - |
| - |

| **Başarı Değerlendirme Sistemi**  **(Assessment Criteria)** | **Faaliyetler (Activities)** | **Adedi (Quantity)** | **Değerlendirmedeki Yüzde Katkısı**  **(Effects on Grading by Percentage)** |
| --- | --- | --- | --- |
| **Yıl İçi Sınavları (Midterm Exams)** | - | - |
| **Kısa Sınavlar (Quizzes)** | 7 (5 highest marks to be assessed | 30% |
| **Ödevler (Homework)** | 2 | 30% |
| **Projeler (Projects)** | 1 | 25% |
| **Dönem Ödevi/Projesi (Term Paper/Project)** | 1 | 15% |
| **Laboratuvar Uygulaması (Laboratory Work)** | - | - |
| **Diğer Uygulamalar (Other Activities)** | - | - |
| **Final Sınavı (Final Exam)** | - | - |

**DERS PLANI**

**(Course Plan)**

| **Hafta** | **Konu** | **Dersin Çıktıları** |
| --- | --- | --- |
| **1** | Bilgisayar sistemlerine giriş | 1 |
| **2** | Sayı sistemleri, ikili değer aritmetiği, ve veri temsili | 1 |
| **3** | Bellek | 2 |
| **4** | Bellek tasarımı, bellek kelime boyutunu ve kapasitesini genişletme | 2 |
| **5** | Merkezi işlem birimi mimarisi | 3 |
| **6** | Adresleme yöntemleri ve komut kümesi | 3 |
| **7** | Programlama örnekleri | 3-4 |
| **8** | Paralel haberleşme arayüzü | 5 |
| **9** | Seri haberleşme arayüzü | 5 |
| **10** | Alt yordam, yığın işlemleri ve kesmeler | 6 |
| **11** | Programlama örnekleri | 4-5-6 |
| **12** | Çevresel Aygıtlar ve Çoklanmış G/Ç teknikleri, önbellek yönetimi teknikleri  (L1, L2, L3) | 7-8 |
| **13** | Mikrodenetleyiciler, DSPler ve x86 bilgisayar mimarileri | 7-8 |
| **14** | Mikroişlemci tabanlı sistem tasarımı | 7-8 |

| **Week** | **Topic** | **Course Outcome** |
| --- | --- | --- |
| **1** | Introduction to computer systems | 1 |
| **2** | Number systems, binary arithmetic and data representation | 1 |
| **3** | Memory | 2 |
| **4** | Memory design and expansion of memory word size and capacity | 2 |
| **5** | The architecture of CPU | 3 |
| **6** | Addressing methods and instruction set | 3 |
| **7** | Programming practice | 3-4 |
| **8** | Parallel communication interface | 5 |
| **9** | Serial communication interface | 5 |
| **10** | Subroutine, stack operation, interrupts | 6 |
| **11** | Programming practice | 4-5-6 |
| **12** | Peripheral Devices and Multiplexed I/O techniques, Cache management techniques (L1, L2, L3) | 7-8 |
| **13** | Microcontrollers, DSPs and x86 computer architectures | 7-8 |
| **14** | Microprocessor-based system design | 7-8 |

**DERSİN BİLGİSAYAR MÜHENDİSLİĞİ ÖĞRENCİ ÇIKTILARI İLE İLİŞKİSİ**

**Relationship between the Course and Student Outcomes**

**(1: “Little”, 2: “Partial”, 3: “Full”, Leave blank if your answer is “None”)**

| **Computer Engineering Department Program Outcomes and Performance Criteria** | | **Level of Contribution** | | |
| --- | --- | --- | --- | --- |
| **1** | **2** | **3** |
| 1 | an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics |  |  | X |
| 2 | an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors |  |  | X |
| 3 | an ability to communicate effectively with a range of audiences |  |  |  |
| 4 | an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts |  |  |  |
| 5 | an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives |  |  | X |
| 6 | an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions |  |  |  |
| 7 | an ability to acquire and apply new knowledge as needed, using appropriate learning strategies |  |  |  |

**HAZIRLANMA BİLGİSİ**

**Edition Information**

| **Prepared by** | **Date** | **Signature** |
| --- | --- | --- |
| **Gökhan Ince** | **24.11.2020** |  |
| **Approved by** | **Date** | **Signature** |
| **Dr.Tolga Ovatman** | **24.11.2020** |  |