**ITU**

**DERS KATALOG FORMU**

**(Course Catalogue Form)**

| **Dersin Adı:**  Gerçek Zamanlı Sistemler | **Course Name:**  Real Time Systems |
| --- | --- |

| **Kodu (Course Code)** | **Yarıyıl (Semester)** | **Kredisi (Local Credits)** | **AKTS Kredisi (ECTS Credits)** | **Ders Uygulaması, Saat/Hafta** | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Ders (Theoretical)** | **Uygulama (Tutorial/Recitation)** | **Laboratuvar (Laboratory)** |
| BLG451E | 7 | 2 | 5 | 2 | - | - |

| **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)** | | Seçmeli (Elective) | |

| **Dersin Önkoşulları (Course Prerequisites)** | BLG212/E Microprocessor Systems | | | |
| --- | --- | --- | --- | --- |
| **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) |
| 15% | 10% | 75% | - |

| **Dersin İçeriği (Course Description)** | Giriş birimi. Frekans ve periyot ölçme. Süre ve olay sayma. Analog giriş ve çıkışlar, alıcılar, yükselticiler, veri seçiciler. Veri yakalama devreleri. Örnekleme oranı, örnekleme hatası, netlik, hassasiyet, A/D ve D/A dönüştürücüler, sinyal izleme ve tutma. Veri işleme, hata ayıklama, işleme hızını artırma, dijital gürültü. Dağınık dizgelerden veri yakalama, iletişim protokol ve yöntemleri. Farkı işletim hızına sahip geri beslemeli denetim sistemlerinden veri yakalama ve işleme. |
| --- | --- |
| Input units. Frequency and period measurement. Timing and event counting. Analogue inputs and outputs, sensors, amplifiers, multiplexers. Data acquisition circuits. Sampling rate, sampling errors, resolution, accuracy, A/D and D/A converters, signal tracking and holding. Data processing, error elimination, increase of processing speed, digital noise. Data acquisition from  distributed systems, communication protocols and methods. Data acquisition and processing from systems that form a closed-control loop with different operating speed. |
| **Dersin Amacı (Course Objective)** | 1. Gerçek zaman sistemlerine ait temel tanımların kapsanması 2. Gerçek zaman sistemleriyle ilgili tasarım ve yöntemler hakkında geniş kapsamlı bir anlama sağlama 3. Gerçek zamanlı sistemler için teorik temeller sağlama 4. Konunun daha iyi anlaşılabilmesi için uygulama örneklerini sunma |
| 1. Covering basic definitions belonging to real-time systems 2. Giving broad understanding of design principles and methods for real-time systems 3. Giving a theoretical base for real-time systems 4. Giving application examples in order to clarify the topic |
| **Dersin Öğrenme Çıktıları (Course Learning Outcomes)** | 1. Alıcılar, alıcı tipleri, alıcı özellikleri ve uygulamaları, 2. A/D, D/A dönüştürücüler, veri seçiciler ve veri yakalama devreleri, 3. Örnekleme oranı, netlik ve işlem süresi, 4. Örnekleme oranı ve netlikten kaynaklanan hatalar, 5. Olay sayma, zaman ölçümü, 6. Gerçek zamanlı sistemlerin tasarım yöntemleri ve 7. Gerçek zaman dillerini kullanmada geniş kapsamlı kavrama ve yetenek kazanacaklardır. |
| 1. Broad understanding of sensors, sensor types, sensor properties and their applications 2. Broad understanding of A/D, D/A converters, multiplexers and data acquisition circuits 3. Broad understanding of sampling period, resolution, processing time 4. Broad understanding of errors due to sampling rate and resolution 5. Broad understanding of event counting, time measurement 6. Broad understanding of real-time systems design methods 7. Broad understanding and ability to use real-time systems languages |

| **Ders Kitabı (Textbook)** | Eşref ADALI, 1996, Gerçek Zaman Dizgeleri, Sistem Yayıncılık |
| --- | --- |
| **Diğer Kaynaklar (Other References)** | Valvano J., 2000, Embedded Microcomputer Systems - Real Brooks/Cole - Thomson Learning  Lawrence, P.D., Mauch, K., 1988, Real Time Microcomputer System Design,  An Introduction, McGraw Hill.  Vandoren, A, 1982, Data Acquisition Systems, Reston. |

| **Ödevler ve Projeler (Homeworks & Projects)** | - |
| --- | --- |
| - |
| **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)** | 1 | 25% |
| **Kısa Sınavlar (Quizzes)** | - | - |
| **Ödevler (Homework)** | - | - |
| **Projeler (Projects)** | 1 | 15% |
| **Dönem Ödevi/Projesi (Term Paper/Project)** | - | - |
| **Laboratuvar Uygulaması (Laboratory Work)** | - | - |
| **Diğer Uygulamalar (Other Activities)** | - | - |
| **Final Sınavı (Final Exam)** | 1 | 55% |

**DERS PLANI**

**(Course Plan)**

| **Hafta** | **Konu** | **Dersin Çıktıları** |
| --- | --- | --- |
| **1** | Gerçek zaman sistemlerinin temel tanım ve kavramları | 1 |
| **2** | Alıcılar | 1 |
| **3** | Analog alıcılar | 1 |
| **4** | Dijital alıcılar | 1 |
| **5** | A/D, D/A dönüştürüceler, netlik | 2 |
| **6** | Örnekleme, çoğullama | 3 |
| **7** | Veri yakalama devreleri ve yöntemleri | 3 |
| **8** | Analog sinyaller, analog sinyallerin örneklenmesinden kaynaklanan hatalar | 4 |
| **9** | Sınıf çalışması | 1, 2, 3, 4 |
| **10** | Dijital sinyaller | 5 |
| **11** | Gerçek zaman sistemlerinin tasarımı | 5, 6 |
| **12** | Gerçek zaman sistem dilleri | 7 |
| **13** | Giriş ve çıkış devreleri | 6 |
| **14** | Gerçek zaman sistemleri için kullanıcı arayüzü | 6 |

| **Week** | **Topic** | **Course Outcome** |
| --- | --- | --- |
| **1** | Basic definitions and concepts of real-time systems | 1 |
| **2** | Sensors | 1 |
| **3** | Analog sensors | 1 |
| **4** | Digital sensors | 1 |
| **5** | A/D, D/A converters, resolution | 2 |
| **6** | Sampling, sample and hold circuits, multiplexing | 3 |
| **7** | Data acquisition circuits and methods | 3 |
| **8** | Analog signals, errors due to the sampling of analog signals | 4 |
| **9** | Class work | 1, 2, 3, 4 |
| **10** | Digital Signals | 5 |
| **11** | Design of Real-time Systems | 5, 6 |
| **12** | Real-time Systems Languages | 7 |
| **13** | Input and Output circuits | 6 |
| **14** | User Interfaces for real time systems | 6 |

**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 |  |  |  |
| 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** |
| --- | --- | --- |
| **Dr.Eşref Adalı** | **01.01.2010** |  |
| **Approved by** | **Date** | **Signature** |
| **Dr.Tolga Ovatman** | **03.12.2020** |  |