**ITU**

**DERS KATALOG FORMU**

**(Course Catalogue Form)**

| **Dersin Adı:**  Mikroişlemci Tasarım Laboratuvarı | **Course Name:**  Microprocessor Design Laboratory |
| --- | --- |

| **Kodu (Course Code)** | **Yarıyıl (Semester)** | **Kredisi (Local Credits)** | **AKTS Kredisi (ECTS Credits)** | **Ders Uygulaması, Saat/Hafta** | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Ders (Theoretical)** | **Uygulama (Tutorial/Recitation)** | **Laboratuvar (Laboratory)** |
| BLG452E | 7 | 2 | 5 | 1 | - | 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)** | BLG322/E Computer Architecture | | | |
| --- | --- | --- | --- | --- |
| **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) |
| - | - | 100% | - |

| **Dersin İçeriği (Course Description)** | VHDL, güncel tümlesik tasarım ortamları, programlama ve benzetim araçları, kombinezonsal sayısal giris/çıkıs islemleri, ardısıl islemler, modüler proje yapısı, sema ortamında tasarım, VHDL’den semaya geçme, mikroislemci bilesenlerinin tasarımı, benzetimi ve gerçeklemesi, mikroislemcili sistem tasarımı, benzetimi ve gerçeklemesi, çok çekirdekli sistem tasarımı, benzetimi ve gerçeklemesi. |
| --- | --- |
| VHDL, up-to-date integrated design environments, programming and simulation tools, combinational digital input/output operations, sequential processes, modular project structure, schematic design tools, upgrading VHDL codes to schematic, microprocessor components design, simulation and implementation, microprocessor system design, simulation and implementation, multi-core system design, simulation and implementation. |
| **Dersin Amacı (Course Objective)** | 1. Eş zamanlı ve ardısıl süreçlerin birlikte sentezlenmesinin VHDL kullanarak ögretilmesi, 2. Algoritmik sayısal sistemlerin FPGA (Sahada Programlanabilir Kapı dizileri) tabanlı kartlar yardımıyla tasarımı ve gerçeklenmesi, 3. Çok çekirdekli sayısal sistem tasarımı ve gerçeklenmesi. |
| 1. A broad understanding of concurrent and sequential circuit synthesis by using VHDL, 2. Design and implementation of algorithmic digital systems by using FPGA based development boards. 3. Design and implementation of multi-core digital systems. |
| **Dersin Öğrenme Çıktıları (Course Learning Outcomes)** | 1. Kombinezonsal ve ardısıl devrelerin kapı dizileri ile laboratuvar ortamında güncel tümlesik tasarım platformları üzerinde tasarımı ve gerçeklemesi 2. Mikroislemcilerin laboratuvar ortamında tasarımı ve gerçeklemesi 3. Mikroislemcili sistemlerin laboratuvar ortamında tasarımı ve gerçeklemesi |
| 1. Design and implementation of combinational and sequential circuits by using up-to date integrated design platforms and gate arrays in laboratory environment 2. Design and implementation of microprocessors in laboratory environment 3. Design and implementation of microprocessor systems in laboratory environment. |

| **Ders Kitabı (Textbook)** | Computer Organization and Architecture: Designing for Performance, 8th edition, William Stallings, Prentice-Hall, 2010 |
| --- | --- |
| **Diğer Kaynaklar (Other References)** | Peter J. Ashenden, The Designer’s Guide to VHDL, 3rd edition, Morgan Kaufmann Publishers, 2008  IEEE Standard VHDL Language Reference Manual, IEEE Std1076, 2000 Edition  FPGA Prototyping by VHDL Examples, Xilinx Spartan-3 Version. Pong P. Chu. Wiley, 2008 |

| **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 | 15% |
| **Kısa Sınavlar (Quizzes)** | - | - |
| **Ödevler (Homework)** | - | - |
| **Projeler (Projects)** | 1 | 15% |
| **Dönem Ödevi/Projesi (Term Paper/Project)** | - | - |
| **Laboratuvar Uygulaması (Laboratory Work)** | 8 | 30% |
| **Diğer Uygulamalar (Other Activities)** | - | - |
| **Final Sınavı (Final Exam)** | 1 | 40% |

**DERS PLANI**

**(Course Plan)**

| **Hafta** | **Konu** | **Dersin Çıktıları** |
| --- | --- | --- |
| **1** | Tasarım ortamı, VHDL ve programlama | 1 |
| **2** | Tasarım ortamı, VHDL ve programlama (devam) | 1 |
| **3** | Mikroişlemci Veri Ünitesi bileşenlerinin FPGA kartlar üzerinde gerçeklenmesi | 2 |
| **4** | Laboratuvarda aritmetik işlemci birimi tasarımı ve gerçeklenmesi | 2 |
| **5** | Modüler yapıların sentezlenmesi, işlemci veri ünitesinin tasarımı ve gerçeklenmesi | 2 |
| **6** | Mikroişlemci kontrol ünitesi tasarımı ve gerçeklenmesi | 2 |
| **7** | Hafıza erişim ve giriş/çıkış işlemlerinin mikroişlemci üzerinde gerçeklenmesi | 2 |
| **8** | Üst düzey mikroişlemci tasarımı | 2 |
| **9** | Üst düzey mikroişlemci tasarımı - Devamı | 2 |
| **10** | Multi-core mikroişlemci tasarımı | 3 |
| **11** | Multi-core mikroişlemci gerçeklenmesi | 3 |
| **12** | Mikroişlemcili dijital sistem tasarımı | 3 |
| **13** | Dijital sistemin gerçeklenmesi | 3 |
| **14** | Dönem projesi – laboratuvar | 3 |

| **Week** | **Topic** | **Course Outcome** |
| --- | --- | --- |
| **1** | Design environments, VHDL and programming | 1 |
| **2** | Design environments, VHDL and programming (con’t) | 1 |
| **3** | Design and implementation of microprocessor data unit’s components in laboratory, on FPGA boards | 2 |
| **4** | Arithmetic Logic Unit design and implementation in laboratory | 2 |
| **5** | Synthesis of modular structures, design and implementation of processor data unit’s components in laboratory | 2 |
| **6** | Design and implementation of microprocessor control unit in laboratory | 2 |
| **7** | Design and implementation in laboratory microprocessor’s access to memory and input/output operations | 2 |
| **8** | Top-level design of a microprocessor | 2 |
| **9** | Top-level design of a microprocessor (con’t) - Classwork | 2 |
| **10** | Multi-core microprocessor design | 3 |
| **11** | Implementation of multi-core microprocessor in laboratory | 3 |
| **12** | Digital system design incorporating microprocessor | 3 |
| **13** | Digital system implementation incorporating microprocessor in laboratory. | 3 |
| **14** | Term project laboratory work | 3 |

**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.Tolga Ovatman** | **03.12.2020** |  |
| **Approved by** | **Date** | **Signature** |
| **Dr.Tolga Ovatman** | **03.12.2020** |  |