**ITU**

**DERS KATALOG FORMU**

**(Course Catalogue Form)**

| **Dersin Adı:**  Robotik | **Course Name:**  Robotics |
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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)** |
| BLG456E | 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)** | BLG253/E Object Oriented Programming  and  MAT281/E Linear Algebra and Applications | | | |
| --- | --- | --- | --- | --- |
| **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) |
| 0% | 20% | 80% | 0% |

| **Dersin İçeriği (Course Description)** | Robotların farklı türlerini, bileşenlerini ve uygulamalarını tanıtır. Mekanik tasarımlar ve farklı sensörleri çalışır. Robotların kontrol mimarilerini, yerelleştirme, haritalama, yol planlama ve robot görme algoritmalarını sunar. İnsan-robot etkileşimi ve güncel robotik uygulamalarına değinir. |
| --- | --- |
| Introduces different types, components and applications of robots. Studies mechanical designs and different sensors. Presents control architectures of robots, localization, mapping, path planning and robot vision algorithms. Briefly presents human-robot interaction and recent robotic applications. |
| **Dersin Amacı (Course Objective)** | 1. Robotlar, onların bileşenleri ve uygulamaları hakkında bilgi sağlama 2. Robotların mekanik tasarımı ve kinematik hesaplamalar yapma becerisi sağlama 3. Temel kontrol mimarisi tasarlama ve yerelleştirme, haritalama, yol planlama ve robot görme algoritmaları becerisi, |
| 1. To provide information on robots, their components and applications, 2. To provide mechanical design of robots and give an ability to solve kinematic calculations, 3. To give an ability to design the main control architecture, localization, mapping, path planning and vision algorithms of a robot system. |
| **Dersin Öğrenme Çıktıları (Course Learning Outcomes)** | 1. Robot tipleri, bileşenler ve uygulamalar geniş bir bakış açısına sahip olma 2. Gerçek dünya problem için en uygun robot türünü belirleme, 3. Mobil robotların kinematik hesaplamaları çözme, 4. Bir robot sistemin ana kontrol mimarisini belirlemek ve uygulamak, 5. En uygun yerelleştirme, haritalama, yol planlama ve vizyon yöntemleri belirlemek ve uygulamak, 6. Robotlara yüksek düzeyde planlama ve öğrenme yetenekleri ekleme ve bir multirobot sistemi için gerekli bile şenleri tasarlamak |
| 1. Have a broad perspective in robot types, components and applications, 2. Determine the most appropriate robot type for a real-world problem, 3. Solve kinematic calculations of mobile robots, 4. Determine and implement the main control architecture of a robot system, 5. Determine and implement the most appropriate localization, mapping, path planning and vision methods, 6. Add high level planning and learning capabilities to robots, and design the required components for a multirobot system |

| **Ders Kitabı (Textbook)** | Bruno Siciliano and Oussama Khatib, Springer Handbook of Robotics, Springer, 2008 |
| --- | --- |
| **Diğer Kaynaklar (Other References)** | Gregory Dudek and Michael Jenkin, Computational Principles of Mobile Robotics, Cambridge University Press; 2nd edition, 2010  Roland Siegwart, Illah Reza Nourbakhsh and Davide Scaramuzza, Introduction to Autonomous Mobile Robots, The MIT Press, 2011 |

| **Ödevler ve Projeler (Homeworks & Projects)** | İki haftalık aralıklarla üç programlama ödevi. Dönemin sonunda teslime dilmek üzere dönem projesi. |
| --- | --- |
| Three programming assignments are given to be handed in a-two-week period. A  term project is given to be handed in at the end of the term. |
| **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)** | - | - |
| **Ödevler (Homework)** | 3 | 25% |
| **Projeler (Projects)** | 1 | 50% |
| **Dönem Ödevi/Projesi (Term Paper/Project)** | - | - |
| **Laboratuvar Uygulaması (Laboratory Work)** | - | - |
| **Diğer Uygulamalar (Other Activities)** | - | - |
| **Final Sınavı (Final Exam)** | 1 | 25% |

**DERS PLANI**

**(Course Plan)**

| **Hafta** | **Konu** | **Dersin Çıktıları** |
| --- | --- | --- |
| **1** | Robotlar ve uygulamaları, robot türleri | 1,2 |
| **2** | Robot Mekanikleri | 1,2 |
| **3** | Lokomasyon | 1,2 |
| **4** | Robot Sensörleri | 1,2 |
| **5** | Alt Düzey Kontrol | 1,2 |
| **6** | Mobil Robot Kinematikleri | 3 |
| **7** | Robot Kontrol Mimarileri | 4 |
| **8** | Yerelleştirme | 5 |
| **9** | Haritalama | 5 |
| **10** | Patika Planlama | 5 |
| **11** | Robot Görüsü | 5 |
| **12** | Robotlarda Öğrenme | 6 |
| **13** | Multirobot sistemleri | 6 |
| **14** | Robot Uygulamaları, Demoları ve Proje Sunumları | 1,2,3,4,5 |

| **Week** | **Topic** | **Course Outcome** |
| --- | --- | --- |
| **1** | Robots and their applications, types of robots | 1,2 |
| **2** | Robot Mechanics | 1,2 |
| **3** | Locomotion | 1,2 |
| **4** | Robot Sensors | 1,2 |
| **5** | Low Level Control | 1,2 |
| **6** | Mobile Robot Kinematics | 3 |
| **7** | Robot Control Architectures | 4 |
| **8** | Localization | 5 |
| **9** | Mapping | 5 |
| **10** | Path Planning | 5 |
| **11** | Robot Vision | 5 |
| **12** | Learning in Robots | 6 |
| **13** | Multirobot Systems | 6 |
| **14** | Robot Applications, Demos and Project Presentations | 1,2,3,4,5 |

**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 | X |  |  |
| 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 | X |  |  |
| 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 |  | X |  |
| 7 | an ability to acquire and apply new knowledge as needed, using appropriate learning strategies |  | X |  |

**HAZIRLANMA BİLGİSİ**

**Edition Information**

| **Prepared by** | **Date** | **Signature** |
| --- | --- | --- |
| **Dr.Hatice Köse** | **01.03.2013** |  |
| **Approved by** | **Date** | **Signature** |
| **Dr.Tolga Ovatman** | **03.12.2020** |  |