**HACETTEPE ÜNİVERSİTESİ**

**MÜHENDİSLİK FAKÜLTESİ**

**ENDÜSTRİ MÜHENDİSLİĞİ BÖLÜMÜ**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Name** | **Code** | **Semester** | **Theory****(hours/week)** | **Application****(hours/week)** | **Laboratory****(hours/week)** | **National****Credit** | **ECTS** |
| **Dynamic Decision Models** | **EMÜ440** | Fall/ Spring | 3 | 0 | 0 | 3 | 6 |
| Prerequisites | EMÜ440 – Fundamental of Industry 4.0 |
| Course language | English |
| Course type | Technical Elective |
| Mode of Delivery | Face-to-face |
| Learning and Teaching strategies  | Lecture, question and answer, problem solving, project design/management, individual study. |
| Instructor (s) | Assoc.Prof.Dr. Reza Vatankhah |
| Course Objective | This course is designed to offer learners an introduction to Industry 4.0, its applications in the manufacturing. Learners will gain deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges. |
| Learning outcomes | Upon completion of this course, the students should be able to* Understand the drivers and enablers of Industry 4.0
* Appreciate the smartness in Smart Factories, Smart cities, smart products and smart services
* Able to outline the various systems used in a manufacturing plant and their role in an Industry 4.0 world
* Appreciate the power of Cloud Computing in manufacturing
* Understand the opportunities, challenges brought about by Industry 4.0 and how organisations and individuals should prepare to reap the benefits
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| Course Content | * Introduction to Industry 4.0
* Road to Industry 4.0
* Related Disciplines, System, Technologies for enabling Industry 4.0
* Role of data, information, knowledge and collaboration in future organizations
* Other Applications and Case Studies
* Business issues in Industry 4.0
 |
| References | * Lasi, H., Fettke, P., Kemper, H. G., Feld, T., & Hoffmann, M. (2014). Industry 4.0. Business & information systems engineering, 6(4), 239-242.
* Lee, J., Bagheri, B., & Kao, H. A. (2015). A cyber-physical systems architecture for industry 4.0-based manufacturing systems. Manufacturing letters, 3, 18-23.
* Platzer, André. Logical analysis of hybrid systems: proving theorems for complex dynamics. Springer Science & Business Media, 2010.
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**ENDÜSTRİ MÜHENDİSLİĞİ LİSANS PROGRAMI (İNGİLİZCE)**

**Course Outline Weekly**

|  |  |
| --- | --- |
| Weeks | Topics |
| 1. | Introduction to Industry 4.0- Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0 |
| 2. | Smart Manufacturing and Cyberphysical Systems |
| 3. | Robotic Automation and Collaborative Robots |
| 4. | Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services |
| 5. | Virtual Manufacturing |
| 6. | Augmented reality |
| 7. | Cloud Computing and Industry 4.0 |
| 8. | Midterm exam |
| 9. | Smart Products |
| 10. | Cyber Security- Blockchain technology |
| 11. | Harnessing and sharing knowledge in organizations |
| 12. | Support System for Industry 4.0 |
| 13. | Cloud Manufacturing- Resource-based view of a firm |
| 14. | Future of Works and Skills for Workers in the Industry 4.0 Era |
| 15. | Study for the Final Exam  |
| 16. | Final exam |

**Assessment Methods**

|  |  |  |
| --- | --- | --- |
| **Course activities** | **Number** | **Percentage** |
| Attendance |  |  |
| Laboratory |  |  |
| Application |  |  |
| Field activities |  |  |
| Specific practical training  |  |  |
| Assignments | 3 | 15% |
| Presentation |  |  |
| Project | 1 | 15% |
| Seminar |  |  |
| Midterms | 1 | 30% |
| Final exam | 1 | 40% |
| Total | 6 | 100% |
| Percentage of semester activities contributing grade success | 5 | 60% |
| Percentage of final exam contributing grade success | 1 | 40% |
| Total |  | 100% |

**Workload and ECTS Calculation**

|  |  |  |  |
| --- | --- | --- | --- |
| Activities | Number | Duration (hour) | Total Work Load |
| Course Duration (x14)  | 14 | 3 | 42 |
| Laboratory |  |  |  |
| Application |  |  |  |
| Specific practical training |  |  |  |
| Field activities |  |  |  |
| **Study Hours Out of Class** (Preliminary work, reinforcement, etc.) | 13 | 3 | 39 |
| Presentation / Seminar Preparation |  |  |  |
| Project | 1 | 30 | 30 |
| Homework assignment | 3 | 10 | 30 |
| Midterms (Study duration ) | 1 | 15 | 15 |
| Final Exam (Study duration)  | 1 | 24 | 24 |
| Total Work Load  |  |  | 180 |

**MATRIX OF THE COURSE LEARNING OUTCOMES VERSUS PROGRAM OUTCOMES**

|  |  |
| --- | --- |
| **Program Outcomes** | **Contribution level** |
| 1 | 2 | 3 | 4 | 5 |
| 1 |  |  | X |  |  |
| 2 |  |  |  |  | X |
| 3 |  | X |  |  |  |
| 4 |  |  |  |  |  |
| 5 |  |  |  | X |  |
| 6 |  |  | X |  |  |
| 7 |  |  | X |  |  |
| 8 |  |  | X |  |  |
| 9 |  | X |  |  |  |
| 10 |  |  |  |  | X |