# FUELL CELLS

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| 1 | Course Title: | FUELL CELLS | |
| 2 | Course Code: | OTO6122 | |
| 3 | Type of Course: | Optional | |
| 4 | Level of Course: | Third Cycle | |
| 5 | Year of Study: | 1 | |
| 6 | Semester: | 2 | |
| 7 | ECTS Credits Allocated: | 5.00 | |
| 8 | Theoretical (hour/week): | 3.00 | |
| 9 | Practice (hour/week): | 0.00 | |
| 10 | Laboratory (hour/week): | 0 | |
| 11 | Prerequisites: | | |
| 12 | Language: | Turkish | |
| 13 | Mode of Delivery: | Face to face | |
| 14 | Course Coordinator: | Prof. Dr. M.İHSAN KARAMANGİL | |
| 15 | Course Lecturers: | | |
| 16 | Contact information of the Course Coordinator: | E-posta : ihsan@uludag.edu.tr<br>T: +90 224 2941978<br>Uludağ Üniversitesi<br>Mühendislik Mimarlık Fakültesi<br>Otomotiv Mühendisliği Bölümü<br>Görükle Kampusu<br>Bursa 16059 | |
| 17 | Website: | | |
| 18 | Objective of the Course: | Aim of this course is to examine the fuel cells detaily. | |
| 19 | Contribution of the Course to Professional Development: | | |
| 20 | Learning Outcomes: | | |
| | | **1** | Learning the fuel cell types and application areas |
| | | **2** | Examining the chemical reactions occurring in fuel cells. |
| | | **3** | Grasping electrical drive mechanism. |
| | | **4** | Learning the electrical engine types used in fuel celled-vehicle. |
| | | **5** | Designing cooling system with fuel and air delivery mechanism. |
| | | **6** | |
| | | **7** | |
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| 21 | Course Content: | | |

**Course Content:**

| Week | Theoretical | Practice |
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| 1 | Definition of fuel cells and basic information | |
| 2 | Fuel cell types | |
| 3 | Fuel cell types | |

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| **4** | Encountered problems in fuel cells | |
| **5** | Fuel cell thermodynamics and characteristic curves | |
| **6** | Fuel cell thermodynamics and characteristic curves | |
| **7** | Fuel cell application areas | |
| **8** | Vehicle propulsion with fuel cell | |
| **9** | Management of fuel celled electrical vehicle ( Fuel delivery system, air delivery system, thermal management system, electrical energy management system ) | |
| **10** | Management of fuel celled electrical vehicle ( Fuel delivery system, air delivery system, thermal management system, electrical energy management system ) | |
| **11** | Fuel cell operating modes | |
| **12** | Electric Engines | |
| **13** | Electric Engines | |
| **14** | Power converter circuits | |

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| **22** | Textbooks, References and/or Other Materials: | 1. Kaya D, Öztürk, H. “Yakıt Pili Teknolojisi, Seçkin Yayıncılık, 2012.<br>2. “Fuel Cell Handbook”, EG&G Technical Services, Inc, 2004.<br>3. “Handbook of Fuel Cells”, Wiley Inc, ISBN: |

| Activites | | Number | Duration (hour) | Total Work Load (hour) |
|---|---|---|---|---|
| **TERM LEARNING ACTIVITIES** | **NUMBER** | **WEIGHT** | | |
| Theoretical | | 14 | 3.00 | 42.00 |
| Practicals/Labs | | 0 | 0.00 | 0.00 |
| Self study and preperation | 0 | 0.00 | 25.00 | 25.00 |
| Homeworks | | 2 | 25.00 | 50.00 |
| Projects | | 0 | 0.00 | 0.00 |
| Final Exam | 1 | 60.00 | | |
| Field Studies | | 0 | 0.00 | 0.00 |
| Midterm exams | | 1 | 25.00 | 25.00 |
| Contribution of Term (Year) Learning Activities to | | 40.00 | | |
| Others | | 0 | 0.00 | 0.00 |
| Final Exams | | 1 | 8.00 | 8.00 |
| Contribution of Final Exam to Success Grade | | 60.00 | | |
| Total Work Load | | | | 150.00 |
| Total work load/ 30 hr | | | | 5.00 |
| Measurement and Evaluation Techniques Used in the | | | | |
| ECTS Credit of the Course | | | | 5.00 |

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| **24** | **ECTS / WORK LOAD TABLE** |

| **25** | **CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS** | | | | | | | | | | | | | | | |
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| | **PQ1** | **PQ2** | **PQ3** | **PQ4** | **PQ5** | **PQ6** | **PQ7** | **PQ8** | **PQ9** | **PQ10** | **PQ11** | **PQ12** | **PQ13** | **PQ14** | **PQ15** | **PQ16** |
| **ÖK1** | 1 | 2 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **ÖK2** | 1 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **ÖK3** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| **ÖK4** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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| **ÖK5** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| **LO: Learning Objectives PQ: Program Qualifications** | | | | | |
|---|---|---|---|---|---|
| **Contribution Level:** | **1 very low** | **2 low** | **3 Medium** | **4 High** | **5 Very High** |