**ESOGU MECHANICAL ENGINEERING DEPARTMENT**

**COURSE INFORMATION FORM**

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| **Course Name** | **Course Code** |
| HYDRAULIC CIRCUITS | 151817430 |

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| **Semester** | **Number of Course Hours per Week** | | **ECTS** |
| **Theory** | **Practice** |
| 7 | 3 | 0 | 5 |

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| **Course Category (Credit)** | | | | |
| **Basic Sciences** | **Engineering Sciences** | **Design** | **General Education** | **Social** |
|  | X |  |  |  |

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| **Course Language** | **Course Level** | **Course Type** |
| Turkish | Undergraduate | Elective |

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| **Prerequisite(s) if any** |  |
| **Objectives of the Course** | Knowing the drive systems and equipment used in mechanical engineering, to create hydraulic circuit systems according to the requirements by using hydraulic circuit elements, to design hydraulic systems and to provide competencies related to the maintenance and repair of machine tools. |
| **Short Course Content** | Examination of hydraulic system elements; hydraulic pumps; hydraulic motors; hydraulic valves; accumulators; general information about hydraulic cylinders. General information about the establishment of hydraulic circuits, automation, comparison of hydraulic and mechanical systems, fault analysis and periodic maintenance in hydraulic systems. |

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| **Learning Outcomes of the Course** | | **Contributed PO(s)** | **Teaching Methods \*** | **Measuring Methods \*\*** |
| **1** | Introducing the hydraulic circuit elements and to design hydraulic systems. | 1, 3, 6 | 1, 5, 6, 7, 11 | A, B, K |
| **2** | To understand the working characteristics of hydraulic elements and circuits and to analyze hydraulic systems. | 1, 2, 5, 6 | 1, 2, 4, 5, 11 | A, B, I, K |
| **3** | To make calculations related to hydraulic systems. | 1, 3, 6, 7 | 1, 2, 6, 10, 11 | A, B, I, K |
| **4** | Performing the basic maintenance and repairs of hydraulic units. | 1, 2, 5 | 1, 2, 5, 11, 12 | A, B, K |
| **5** | To recognize hydraulic elements and to understand and interpret how the circuit will work in a drawn diagram | 1, 2, 5, 6 | 5, 7, 10, 11, 12 | A, B, K |
| **6** | To be able to establish a working/functional hydraulic circuit by selecting the elements to create a new hydraulic system. | 1, 6, 7, 10 | 7, 10, 11, 12, 13 | A, B, I, K |

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| **Main Textbook** | Hydraulic Systems, Ravi D., Andries B. Elsevier, March, 2005.  Hydraulic and Pneumatic Theory and Applications, Prof. Dr. Yaşar Pancar, 1998.  Hydraulic - Pneumatic FESTO –Publ., 2010. |
| **Supporting References** | Handbook of Hydraulic Fluid Technology, George Toten, Newyork, 1998.  Hydraulic Fluid Power, Fatih Özcan-Mert Educational Publ.,2016.  Hydraulic handbook, 8th Ed., R.H.Warring, Trade and Techn. Press, England, 1983. |
| **Necessary Course Material** | Computer, lecture notes, books, projector and machine equipment in hydraulic laboratory. |

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| **Course Schedule** | |
| **1** | Application of pressure units, Pascal's law, continuity in flow and Bernoulli's equation |
| **2** | Understanding the properties of hydraulic fluid, advantages and disadvantages of hydraulic systems |
| **3** | Intoducing hydraulic circuit elements |
| **4** | Introducing standard symbols used in hydraulics |
| **5** | Introducing and understanding hydraulic pumps and hydraulic cylinders |
| **6** | Introducing and understanding hydraulic valves, accumulators and other circuit elements |
| **7** | Creating a hydraulic circuit diagram |
| **8** | Mid-Term Exam |
| **9** | Understanding the physical properties of air, Boyle's law, Charles' law, absolute temperature |
| **10** | Introducing the working principles of hydraulic circuits and selecting the elements used |
| **11** | Designing working sample hydraulic circuits |
| **12** | Controlling the layout and movement of elements used in hydraulic circuit design |
| **13** | Detecting and analyzing the hydraulic system failures |
| **14** | Resolving the hydraulic failures |
| **15** | Performing periodic maintenance and checks of systems |
| **16,17** | Final Exam |

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| **Calculation of Course Workload** | | | |
| **Activities** | **Number** | **Time (Hour)** | **Total Workload (Hour)** |
| Course Time (number of course hours per week) | 14 | 3 | 42 |
| Classroom Studying Time (review, reinforcing, prestudy,….) | 14 | 3 | 42 |
| Homework |  |  |  |
| Quiz Exam | 2 | 2 | 4 |
| Studying for Quiz Exam | 2 | 4 | 8 |
| Oral exam |  |  |  |
| Studying for Oral Exam |  |  |  |
| Report (Preparation and presentation time included) |  |  |  |
| Project (Preparation and presentation time included) |  |  |  |
| Presentation (Preparation time included) |  |  |  |
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| Mid-Term Exam | 1 | 2 | 2 |
| Studying for Mid-Term Exam | 1 | 15 | 15 |
| Final Exam | 1 | 2 | 2 |
| Studying for Final Exam | 1 | 20 | 20 |
|  | **Total workload** | | **135** |
|  | **Total workload / 30** | | **4,5** |
|  | **Course ECTS Credit** | | **5** |

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| **Evaluation** | |
| **Activity Type** | **%** |
| Mid-term | 30 |
| Quiz | 10 |
| Quiz | 10 |
| Bir öğe seçin. |  |
| Bir öğe seçin. |  |
| **Final Exam** | 50 |
| **Total** | 100 |

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| **RELATIONSHIP BETWEEN THE COURSE LEARNING OUTCOMES AND THE PROGRAM OUTCOMES (PO)** (5: Very high, 4: High, 3: Middle, 2: Low, 1: Very low) | | |
| **NO** | **PROGRAM OUTCOME** | **Contribution** |
| **1** | Adequate knowledge in mathematics, science and mechanical engineering; developing the ability to apply theoretical and applied knowledge in these fields to model and solve mechanical engineering problems. | 5 |
| **2** | The skills to detect, define, formulate and solve complex engineering problems in Mechanical Engineering and related fields by selecting and applying appropriate analysis and modeling methods. | 4 |
| **3** | Ability to design a complex system, device or product under realistic constraints and conditions, in line with a specified goal, by applying modern design methods. | 4 |
| **4** | Ability to develop, select, use modern techniques and tools required for Mechanical Engineering applications and to effectively utilize information technologies. | 2 |
| **5** | The skills to design and conduct experiments, collect data, analyze and interpret results to investigate Mechanical Engineering problems. | 5 |
| **6** | Ability to work individually, within disciplines and in interdisciplinary teams. | 4 |
| **7** | Ability to communicate effectively in Turkish, both verbally and in writing, and to use/improve foreign language knowledge | 1 |
| **8** | Awareness of the necessity of lifelong learning; ability to access information, follow developments in science and technology, and constantly renew oneself. | 4 |
| **9** | Awareness of professional and ethical responsibility | 5 |
| **10** | Knowledge of business practices such as project management, risk management and change management; awareness of entrepreneurship, innovation and sustainable development | 3 |
| **11** | Knowledge of the global and societal impacts of engineering practices on health, the environment and safety; awareness of national and international legal regulations and standards and the legal implications of engineering solutions. | 2 |

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| **LECTUTER(S)** | | | | |
| **Prepared by** | Assoc. Prof. Dr. H. Sevil ERGÜR |  |  |  |
| **Signature(s)** |  |  |  |  |

**Date:**11.07.2024