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|  **COURSE DETAILS** |
| **Course Name** | Mathematical Modelling of Hydrocarbon Reservoirs |

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| **Language of Instruction** | Turkish |

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| **Level of Instruction** | Associate | Undergraduate  | MA(X) | Ph.D. () |

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| **Education System** |
| Formal Education (X) | Distance Education () | Other |

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| **Type of Course** | **Course Area Code** | **Course Optical Code** |
| Comp () | Elective (x) |  |  |

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| **Theory** | **Practice Time** | **Total Hours** | **Semester** | **National Credit** | **ECTS Credits** |
| 3 | 0 | 3 | Spring | 3 | 6 |

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| Course Aim |

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|  | * To define mathematical equations governing hydrocarbon flow and/or water in reservoirs
* To solve the obtained mathematical equations by numerical methods
* To conduct reservoir simulations by numerical methods and to evaluate the output results
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| **Course Content** | Introduction to reservoir simulation, Basic mathematical equations, Flow parameters in porous media, Numerical solution methods, Porous media equations for different fluids. |

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| **Prerequisites**  | - |

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| **Course Instructor** | Assistant Professor Şükrü MEREY |

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| **Assistant Instructor** |   |

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| **Text Book / Recommended Reading** | * Ertekin, Turgay, Jamal H. Abou-Kassem and Gregory R. King, Basic Applied Reservoir Simulation, Henry L. Doherty Memorial Fund of AIME, Society of Petroleum Engineers, Richardson, TX 2001.
* Peaceman, Donald W., Fundamentals of Numerical Reservoir Simulation, Elsevier, New York, 1977.

Chen, Z. Reservoir Simulation: Mathematical Techniques in Oil Recovery. Society of Industrial and Applied Mathematics, Philadelphia, PA 2007.* Kassem, J.H., Ali, S., Islam, M., Petroleum Reservoir Simulation: A Basic Approach, Gulf Publishing Company, Houston, TX, 2006.
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| **Grading Evaluation System** |
| (X) Direct Conversion System |   | () Curve |
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|  | **Tools** | **Number** | **Rate** |
|  | Attendance and Participation | 15 | 5 |
|  | Research homework | 1 | 15 |
|  | Quiz | 4 | 16 |
| **Measurement and Evaluation** | Presentations | 1 | 10 |
|  | Literature | 1 | 4 |
|  | Semester Exam | 1 | 50 |
|  | **Total** |  | **100%** |

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| **Subjects by Week** |
| **Week** | **Topics** | **Teaching Methods** |
| 1 | Introduction to Reservoir Simulation | Lecture, discussion, sampling. |
| 2 | Review of Reservoir Engineering Concepts | Lecture, discussion, sampling. |
| 3 | Review of Basic Mathematical Concepts | Lecture, discussion, sampling. |
| 4 | Mathematical Equations for Single Phase Flow in Porous Media | Lecture, discussion, sampling. |
| 5 | Finite Difference Method Solutions | Lecture, discussion, sampling. |
| 6 | Explicit, Implicit, And Crank-Nicholson Methods | Lecture, discussion, sampling. |
| 7 | Control Volume Approach | Lecture, discussion, sampling. |
| 8 | Reservoir Heterogeneities | Lecture, discussion, sampling. |
| 9 | 2D and 3D Flow | Lecture, discussion, sampling. |
| 10 | Well and Well Models | Lecture, discussion, sampling. |
| 11 | Multiphase Flow in Porous Media | Lecture, discussion, sampling. |
| 12 | 1D IMPES for Multiphase Flow | Lecture, discussion, sampling. |
| 13 | Introduction to Eclipse | Lecture, discussion, sampling. |
| 14.  | Numerical Modelling with Eclipse | Lecture, discussion, sampling. |
| 15 | Final | Written exam |

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| **Program Outcomes** | 01 | 02 | 03 | 04 |
| PO 01  | To understand the numerical solution of flow in porous media equations | 5 | 4 | 4 | 5 |
| PO 02 | To understand the finite difference approximation methods to linear flow equations | 4 | 5 | 5 | 4 |
| PO 03 | To understand the difference between 1D, 2D and 3D flow in porous media | 5 | 4 | 4 | 5 |
| PO 04 | To be able to make necessary assumptions to simply equations and to choose best numerical method | 5 | 5 | 5 | 5 |
| PO 05 | To understand the effect of multiphases in reservoir simulation | 5 | 5 | 5 | 5 |

\* 1: Very Low 2: Low 3: Medium 4: High 5: Very high

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| **Student workload / ECTS account**  |
| **Activities** | **Number** | **Preparation** | **Duration of Activity** | **Total Workload** |
| Theoretical Course | 14 | - | 3 | 42 |
| Scientific homework  | 14 | - | 2 | 28 |
| The library search | 2 | - | 10 | 20 |
| Presentation | 2 | - | 15 | 30 |
| Quiz | 1 | - | 30 | 30 |
| Semester Exam | 1 | - | 40 | 40 |
| Total Workload (Hour) | 34 |  |  | 190 |
| Roll [Total Workload (hours) / week work load (30)] = ECTS Credit | 190/30=6,33 |