**Content**

| Course Code | Course Name | Semester | Theory | Practice | Lab | Credit | ECTS |
|---|---|---|---|---|---|---|---|
| MAT301 | Metric Topology | 5 | 3 | 2 | 0 | 5 | 8 |

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| Prerequisites | MAT101, MAT102 |
| Admission Requirements | MAT101, MAT102 |

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| Language of Instruction | |
| Course Type | Compulsory |
| Course Level | Bachelor Degree |
| Objective | The aim of this course is to introduce the theory of metric spaces and teach the fundamental properties and applications of these structures. By learning the concept of metric spaces, students will gain a deep understanding of important results in analysis and topology. Additionally, the course aims to develop students' skills in abstract mathematical thinking. |
| Content | This course aims to teach the fundamental concepts of the theory of metric spaces. Initially, the basic properties on R and sequences in R will be covered, followed by an introduction to the concept of metric spaces, supported by various examples. The open and closed sets in metric spaces will be discussed, and the fundamental properties of these structures will be examined. The convergence of sequences in metric spaces and the concept of complete metric spaces will be studied in detail. The concept of continuous functions and continuity in metric spaces will also be included in the course content. Furthermore, the notion of compactness in metric spaces will be emphasized and studied in detail over three weeks. In the final part of the course, the Banach fixed-point theorem and its various applications will be discussed. |
| References | An introduction to real analysis, Tosun Terzioğlu |

**Theory Topics**

| Week | Weekly Contents |
|---|---|
| 1 | Properties of the set of real numbers |
| 2 | Sequences in the set of real numbers, accumulation points of sets, limit values of sequences |
| 3 | Open and closed subsets of the set of real numbers |
| 4 | Metric spaces: definition and examples |
| 5 | Open and closed sets in metric spaces |
| 6 | Sequences and convergence in metric spaces, accumulation points of sets, limit values of sequences |
| 7 | Topological properties of metric spaces: completeness |
| 8 | Topological properties of metric spaces: compactness |
| 9 | Topological properties of metric spaces: connectedness |
| 10 | Sequences and limits in function spaces |
| 11 | Open and closed sets in function spaces |
| 12 | Topological properties of function spaces |
| 13 | Banach fixed-point theorem |
| 14 | Applications of the Banach fixed-point theorem |