# NUMBER THEORY

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| **1** | Course Title: | NUMBER THEORY | |
| **2** | Course Code: | MAT3020 | |
| **3** | Type of Course: | Compulsory | |
| **4** | Level of Course: | First Cycle | |
| **5** | Year of Study: | 3 | |
| **6** | Semester: | 6 | |
| **7** | ECTS Credits Allocated: | 5.00 | |
| **8** | Theoretical (hour/week): | 2.00 | |
| **9** | Practice (hour/week): | 2.00 | |
| **10** | Laboratory (hour/week): | 0 | |
| **11** | Prerequisites: | None | |
| **12** | Language: | Turkish | |
| **13** | Mode of Delivery: | Face to face | |
| **14** | Course Coordinator: | Prof. Dr. İSMAİL NACİ CANGÜL | |
| **15** | Course Lecturers: | Yrd. Doç. Dr. Musa DEMİRCİ, Yrd. Doç. Dr. Hacer ÖZDEN | |
| **16** | Contact information of the Course Coordinator: | cangul@uludag.edu.tr, 0224 2941756, Fen-Edebiyat Fakültesi, Matematik Bölümü, 16059, Görükle / Bursa | |
| **17** | Website: | http://www.ismailnacicangul.com/ | |
| **18** | Objective of the Course: | To give definitions and detailed properties of algebraic structures; especially groups, rings and fields, types of groups, transtormations between groups, quotient group together with the origins of the notions. | |
| **19** | Contribution of the Course to Professional Development: | | |
| **20** | Learning Outcomes: | | |
| | | **1** | Knows algebraic structures and their properties. |
| | | **2** | Can use the transformations between algebraic structures. |
| | | **3** | Has an idea about at least one of the computer programmes in group theory. |
| | | **4** | Can realise applications of algebraic structures. |
| | | **5** | Knows geometric properties of groups. |
| | | **6** | Knows the corresponding English meanings of the main notions. |
| | | **7** | |
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| **21** | Course Content: | | |

**Course Content:**

| Week | Theoretical | Practice |
|---|---|---|
| **1** | Introduction, groups | Examples of groups |
| **2** | Group examples and basic properties | Examples of binary operations |
| **3** | Subgroups | Examples of subgroups |
| **4** | Normal subgroups | Examples of normal subgroups |

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| **5** | Center of a group and commutator subgroups | Calculation of the center of a group and commutator subgroups |
| **6** | Permutation groups | Symmetric group on 3 elements |
| **7** | Group transformations | Examples of isomorphism and homomorphism, calculation of kernel |
| **8** | Cosets and Lagrange theorem | Examples of cosets |
| **9** | Midterm exam, Quotient group and its properties | Examples of quotient groups |
| **10** | Cyclic groups, their properties and subgroups | Calculation of the subgroups of some cyclic groups and subgroup tables |
| **11** | Dihedral group, isomorphism theorems, direct product of groups | Examples of Dihedral groups and direct products |
| **12** | Rings, basic properties | Examples of rings |
| **13** | Character of a ring, zero divisors, subrings and ideals | Calculation of characteristics and zero divisors |
| **14** | Quotient ring, fields, structure of finite fields | Examples of finite fields |

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| **22** | Textbooks, References and/or Other Materials: | Lecture Notes, İsmail Naci CANGÜL |
| **23** | Assesment | |

| **TERM LEARNING ACTIVITIES** | **NUMBER** | **WEIGHT** |
|---|---|---|
| Midterm Exam | 1 | 40.00 |
| Quiz | 0 | 0.00 |
| Home work-project | 0 | 0.00 |
| Final Exam | 1 | 60.00 |
| Total | 2 | 100.00 |
| Contribution of Term (Year) Learning Activities to Success Grade | | 40.00 |
| Contribution of Final Exam to Success Grade | | 60.00 |
| Total | | 100.00 |
| Measurement and Evaluation Techniques Used in the Course | | |

**24 ECTS / WORK LOAD TABLE**

| Activites | Number | Duration (hour) | Total Work Load (hour) |
|---|---|---|---|
| Theoretical | 14 | 2.00 | 28.00 |
| Practicals/Labs | 14 | 2.00 | 28.00 |
| Self study and preperation | 14 | 5.00 | 70.00 |
| Homeworks | 0 | 0.00 | 0.00 |
| Projects | 0 | 0.00 | 0.00 |
| Field Studies | 0 | 0.00 | 0.00 |
| Midterm exams | 1 | 20.00 | 20.00 |
| Others | 0 | 0.00 | 0.00 |
| Final Exams | 1 | 28.00 | 28.00 |
| Total Work Load | | | 194.00 |
| Total work load/ 30 hr | | | 5.80 |
| ECTS Credit of the Course | | | 5.00 |

| 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** | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **ÖK2** | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **ÖK3** | 0 | 0 | 5 | 0 | 0 | 0 | 4 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| **ÖK4** | 2 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **ÖK5** | 0 | 3 | 0 | 0 | 3 | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **ÖK6** | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 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** | | | | | | |