

# ABSTRACT ALGEBRA

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|-----------|---|--|---|
| <b>1</b>  | Course Title:   | ABSTRACT ALGEBRA   |   |
| <b>2</b>  | Course Code:  | MAT3019  |   |
| <b>3</b>  | Type of Course:   | Compulsory   |   |
| <b>4</b>  | Level of Course:  | First Cycle  |   |
| <b>5</b>  | Year of Study:  | 3  |   |
| <b>6</b>  | Semester:   | 5  |   |
| <b>7</b>  | ECTS Credits Allocated:                                 | 6.00   |   |
| <b>8</b>  | Theoretical (hour/week):                                | 2.00   |   |
| <b>9</b>  | Practice (hour/week):                                   | 2.00   |   |
| <b>10</b> | Laboratory (hour/week):                                 | 0  |   |
| <b>11</b> | Prerequisites:  | None   |   |
| <b>12</b> | Language:   | Turkish  |   |
| <b>13</b> | Mode of Delivery:                                       | Face to face   |   |
| <b>14</b> | Course Coordinator:                                     | Prof. Dr. İSMAİL NACİ CANGÜL   |   |
| <b>15</b> | Course Lecturers:                                       | Yrd. Doç. Dr. Musa DEMİRCİ, Yrd. Doç. Dr. Hacer ÖZDEN  |   |
| <b>16</b> | Contact information of the Course Coordinator:          | cangul@uludag.edu.tr, 0224 2941756, Fen-Edebiyat Fakültesi, Matematik Bölümü, 16059, Görükle / Bursa   |   |
| <b>17</b> | Website:  | <a href="http://www.ismailnacicangul.com/">http://www.ismailnacicangul.com/</a>  |   |
| <b>18</b> | Objective of the Course:                                | To teach divisibility, congruences, linear Diophant equations, arithmetic functions, and also the applications of those together with the origins of the notions |   |
| <b>19</b> | Contribution of the Course to Professional Development: |  |   |
| <b>20</b> | Learning Outcomes:                                      |  |   |
|           |   | <b>1</b>   | Differentiates between prime and composite numbers and knows the reasons of different situations. |
|           |   | <b>2</b>   | Knows the Notion of divisibility on the ring of integers and related notions.                     |
|           |   | <b>3</b>   | Knows daily applications of Diophantine equations.  |
|           |   | <b>4</b>   | Knows daily applications of congruences.  |
|           |   | <b>5</b>   | Knows the origins and history of the main notions.  |
|           |   | <b>6</b>   | Knows the corresponding English meanings of the main notions.                                     |
|           |   | <b>7</b>   |   |
|           |   | <b>8</b>   |   |
|           |   | <b>9</b>   |   |
|           |   | <b>10</b>  |   |
| <b>21</b> | Course Content:   |  |   |
|           |   | <b>Course Content:</b>   |   |
| Week      | Theoretical   | Practice   |   |
| <b>1</b>  | Divisibility on integers                                | Divisibility examples  |   |
| <b>2</b>  | Division and Euclid algorithms and gcd and lcm          | Examples of division and Euclid algorithms   |   |
| <b>3</b>  | Linear Diophantine equations                            | Examples of linear Diophantine equations   |   |

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|--|---|--|
| 4  | Fundamental theorem of arithmetic and divisors      | Examples of the number and the sum of the divisors of a number         |
| 5  | Euler $\phi$ -function                              | Calculation of the values of Euler $\phi$ -function                    |
| 6  | Properties of Euler $\phi$ -function                | Examples of properties   |
| 7  | Congruences   | Examples of congruences  |
| 8  | Operations in $Z_m$ and properties of congruences   | Examples of properties   |
| 9  | Midterm exam, Euler and Fermat theorems             | Examples of Euler and Fermat theorems                                  |
| 10   | Linear congruences with one variable                | Examples of linear congruences   |
| 11   | Linear congruences and linear Diophantine equations | Relation between linear congruences and linear Diophantine equations   |
| 12   | Congruence systems                                  | Solution of congruence systems   |
| 13   | Quadratic residues and Legendre symbol              | Calculation of quadratic residues                                      |
| 14   | Gauss' quadratic reciprocity law                    | Applications of reciprocity law  |
| 22   | Textbooks, References and/or Other Materials:       | 1. Sayılar Teorisi Problemleri, İsmail Naci Cangül & Basri Çelik, 2005 |
| 23   | Assesment   |  |
| <b>TERM LEARNING ACTIVITIES</b>                                  |   |  |
|  | <b>NUMBER</b>                                       | <b>WEIGHT</b>  |
| Midterm Exam   | 1   | 40.00  |
| Quiz   | 0   | 0.00   |
| Homeworks, Performances  | 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   | <b>ECTS / WORK LOAD TABLE</b>                       |  |

| 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, Performances    | 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  |        |                 | 6.00                   |

| 25   | CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS |     |     |              |     |     |                 |     |     |               |      |      |                    |      |      |      |
|--|---|-----|-----|--------------|-----|-----|-----------------|-----|-----|---------------|------|------|--------------------|------|------|------|
|  | PQ1   | PQ2 | PQ3 | PQ4          | PQ5 | PQ6 | PQ7             | PQ8 | PQ9 | PQ10          | PQ11 | PQ12 | PQ13               | PQ14 | PQ15 | PQ16 |
| ÖK1  | 5   | 0   | 2   | 0            | 0   | 0   | 2               | 2   | 0   | 0             | 0    | 0    | 0                  | 0    | 0    | 0    |
| ÖK2  | 5   | 3   | 0   | 0            | 2   | 0   | 5               | 2   | 0   | 0             | 0    | 0    | 0                  | 0    | 0    | 0    |
| ÖK3  | 3   | 0   | 0   | 0            | 3   | 0   | 5               | 2   | 2   | 0             | 0    | 0    | 0                  | 0    | 0    | 0    |
| ÖK4  | 5   | 0   | 0   | 0            | 0   | 0   | 0               | 2   | 2   | 0             | 0    | 0    | 0                  | 0    | 0    | 0    |
| ÖK5  | 0   | 0   | 0   | 0            | 0   | 0   | 0               | 0   | 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    |
| <b>LO: Learning Objectives    PQ: Program Qualifications</b> |   |     |     |              |     |     |                 |     |     |               |      |      |                    |      |      |      |
| <b>Contrib<br/>ution<br/>Level:</b>                          | <b>1 very low</b>   |     |     | <b>2 low</b> |     |     | <b>3 Medium</b> |     |     | <b>4 High</b> |      |      | <b>5 Very High</b> |      |      |      |