

# NONDESTRUCTIVE EVALUATION METHODS

|           |                                                         |                                                                                                                                                                                       |
|-----------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b>  | Course Title:                                           | NONDESTRUCTIVE EVALUATION METHODS                                                                                                                                                     |
| <b>2</b>  | Course Code:                                            | MAK4419                                                                                                                                                                               |
| <b>3</b>  | Type of Course:                                         | Optional                                                                                                                                                                              |
| <b>4</b>  | Level of Course:                                        | First Cycle                                                                                                                                                                           |
| <b>5</b>  | Year of Study:                                          | 4                                                                                                                                                                                     |
| <b>6</b>  | Semester:                                               | 7                                                                                                                                                                                     |
| <b>7</b>  | ECTS Credits Allocated:                                 | 3.00                                                                                                                                                                                  |
| <b>8</b>  | Theoretical (hour/week):                                | 2.00                                                                                                                                                                                  |
| <b>9</b>  | Practice (hour/week):                                   | 0.00                                                                                                                                                                                  |
| <b>10</b> | Laboratory (hour/week):                                 | 0                                                                                                                                                                                     |
| <b>11</b> | Prerequisites:                                          |                                                                                                                                                                                       |
| <b>12</b> | Language:                                               | Turkish                                                                                                                                                                               |
| <b>13</b> | Mode of Delivery:                                       | Face to face                                                                                                                                                                          |
| <b>14</b> | Course Coordinator:                                     | Doç. Dr. Hakan AYDIN                                                                                                                                                                  |
| <b>15</b> | Course Lecturers:                                       |                                                                                                                                                                                       |
| <b>16</b> | Contact information of the Course Coordinator:          | e-mail: hakanay@uludag.edu.tr<br>Tel: + 90 (224) 294 06 52<br>Adres: Uludağ Üniversitesi, Mühendislik-Mimarlık Fakültesi, Makine Mühendisliği Bölümü, 16059, Görükle-Bursa, Türkiye.  |
| <b>17</b> | Website:                                                |                                                                                                                                                                                       |
| <b>18</b> | Objective of the Course:                                | In this course ,structure of the damages and defects in metals and alloys that can be used in the determination of non-destructive material testing methods is intended to introduce. |
| <b>19</b> | Contribution of the Course to Professional Development: |                                                                                                                                                                                       |
| <b>20</b> | Learning Outcomes:                                      |                                                                                                                                                                                       |
|           | <b>1</b>                                                | To be able to classify nondestructive testing methods.                                                                                                                                |
|           | <b>2</b>                                                | To be able to distinguish defects in materials.                                                                                                                                       |
|           | <b>3</b>                                                | To be able to comprehend defects while occurring in production stages such as welding, casting and plastic deformation.                                                               |
|           | <b>4</b>                                                | To be able to determine the field of application of ultrasonic testing methods and evaluate the results.                                                                              |
|           | <b>5</b>                                                | To be able to determine the field of application of radiographic testing methods and evaluate the results.                                                                            |
|           | <b>6</b>                                                | To be able to determine the field of application of magnetic particle testing methods and evaluate the results.                                                                       |
|           | <b>7</b>                                                | To be able to determine the field of application of magnetic particle testing methods and evaluate the results.                                                                       |
|           | <b>8</b>                                                | To be able to determine the field of application of penetrating fluid testing method and evaluate the results.                                                                        |
|           | <b>9</b>                                                | To be able to determine the field of application of pressurized gas or pressurized liquid testing method and evaluate the results.                                                    |
|           | <b>10</b>                                               | To be able to compare all nondestructive testing techniques relative to each other and decide which technique can be used.                                                            |
| <b>21</b> | Course Content:                                         |                                                                                                                                                                                       |
|           | <b>Course Content:</b>                                  |                                                                                                                                                                                       |

| Week                                                                                                          | Theoretical                                                                                                     | Practice                                                                                                                                                                                                                                                                            |                                                                                             |                        |
|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|------------------------|
| 1                                                                                                             | Course presentation and content. General information about the non-destructive testing of materials.            |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| 2                                                                                                             | Usage purposes of non-destructive testing methods and classification of methods.                                |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| 3                                                                                                             | Material defects which can be detected by non destructive testing.                                              |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| 4                                                                                                             | Damage and structural defects while in material processing such as casting and welding. Heat treatment defects. |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| 5                                                                                                             | Damage and structural defects while in material processing such as forging and rolling.                         |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| 6                                                                                                             | Ultrasonic testing methods and basic principles.                                                                |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| 7                                                                                                             | Determine the field of application of ultrasonic testing methods and to evaluate the results.                   |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| 8                                                                                                             | Midterm Exam                                                                                                    |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| 9                                                                                                             | Radiographic testing methods and basic principles.                                                              |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| 10                                                                                                            | Radiographic testing method application areas. Radiographic examination techniques weaknesses and advantages.   |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| 11                                                                                                            | Radiographic examination method for example; internal stress measurement.                                       |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| Activites                                                                                                     |                                                                                                                 | Number                                                                                                                                                                                                                                                                              | Duration (hour)                                                                             | Total Work Load (hour) |
| 13                                                                                                            | Theoretical Testing methods of the basic principles and applications with Eddy current.                         | 14                                                                                                                                                                                                                                                                                  | 2.00                                                                                        | 28.00                  |
| Practicals/Labs                                                                                               |                                                                                                                 | 0                                                                                                                                                                                                                                                                                   | 0.00                                                                                        | 0.00                   |
| Self study and preparation examination methods and applications Pressurized gas or pressurized liquid testing |                                                                                                                 | 5                                                                                                                                                                                                                                                                                   | 2.00                                                                                        | 10.00                  |
| Homeworks                                                                                                     |                                                                                                                 | 1                                                                                                                                                                                                                                                                                   | 15.00                                                                                       | 15.00                  |
| Projects                                                                                                      |                                                                                                                 | 0                                                                                                                                                                                                                                                                                   | 0.00                                                                                        | 0.00                   |
| 22 Textbooks, References and/or Others                                                                        |                                                                                                                 | 1                                                                                                                                                                                                                                                                                   | 0.00                                                                                        | 0.00                   |
| Field Studies                                                                                                 |                                                                                                                 | 0                                                                                                                                                                                                                                                                                   | 0.00                                                                                        | 0.00                   |
| Midterm exams                                                                                                 |                                                                                                                 | 2                                                                                                                                                                                                                                                                                   | 12.50                                                                                       | 25.00                  |
| Others                                                                                                        |                                                                                                                 | 1                                                                                                                                                                                                                                                                                   | 10.00                                                                                       | 10.00                  |
| Final Exams                                                                                                   |                                                                                                                 | 1                                                                                                                                                                                                                                                                                   | 15.00                                                                                       | 15.00                  |
| Total Work Load                                                                                               |                                                                                                                 |                                                                                                                                                                                                                                                                                     |                                                                                             | 90.00                  |
| Total work load/ 30 hr                                                                                        |                                                                                                                 | 5                                                                                                                                                                                                                                                                                   | Material Information and Testing, Anık, Selahaddin, Breen Publishing House, İstanbul, 2000. | 9.00                   |
| ECTS Credit of the Course                                                                                     |                                                                                                                 |                                                                                                                                                                                                                                                                                     |                                                                                             | 3.00                   |
|                                                                                                               |                                                                                                                 | Alfa-2004.<br>7. Plastics Materials and Processing, Strong A.B., Prentice-Hall Inc. 2000.<br>8. Werkstoffprüfung mit Ultraschall, Krautkramer J. und Krautkramer H. Springer – Verlag, Berlin 1985.<br>9. Material Information, Güngör, Yasin, Beta Publising House, İstanbul,2001. |                                                                                             |                        |
| 23                                                                                                            | Assesment                                                                                                       |                                                                                                                                                                                                                                                                                     |                                                                                             |                        |
| TERM LEARNING ACTIVITIES                                                                                      |                                                                                                                 | NUMBE R                                                                                                                                                                                                                                                                             | WEIGHT                                                                                      |                        |
| Midterm Exam                                                                                                  |                                                                                                                 | 1                                                                                                                                                                                                                                                                                   | 40.00                                                                                       |                        |
| Quiz                                                                                                          |                                                                                                                 | 0                                                                                                                                                                                                                                                                                   | 0.00                                                                                        |                        |
| Home work-project                                                                                             |                                                                                                                 | 1                                                                                                                                                                                                                                                                                   | 10.00                                                                                       |                        |
| Final Exam                                                                                                    |                                                                                                                 | 1                                                                                                                                                                                                                                                                                   | 50.00                                                                                       |                        |

|                                                                  |        |        |
|------------------------------------------------------------------|--------|--------|
| Total                                                            | 3      | 100.00 |
| Contribution of Term (Year) Learning Activities to Success Grade | 50.00  |        |
| Contribution of Final Exam to Success Grade                      | 50.00  |        |
| Total                                                            | 100.00 |        |
| Measurement and Evaluation Techniques Used in the Course         |        |        |

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| <b>24</b> | <b>ECTS / WORK LOAD TABLE</b> |
|-----------|-------------------------------|

| <b>25</b>                                                    | <b>CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS</b> |     |              |     |                 |     |               |     |                    |      |      |      |      |      |      |      |
|--------------------------------------------------------------|----------------------------------------------------------------------|-----|--------------|-----|-----------------|-----|---------------|-----|--------------------|------|------|------|------|------|------|------|
|                                                              | PQ1                                                                  | PQ2 | PQ3          | PQ4 | PQ5             | PQ6 | PQ7           | PQ8 | PQ9                | PQ10 | PQ11 | PQ12 | PQ13 | PQ14 | PQ15 | PQ16 |
| ÖK1                                                          | 0                                                                    | 0   | 0            | 0   | 0               | 0   | 0             | 0   | 0                  | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| ÖK2                                                          | 0                                                                    | 0   | 0            | 0   | 0               | 0   | 0             | 0   | 0                  | 0    | 0    | 3    | 0    | 0    | 0    | 0    |
| ÖK3                                                          | 0                                                                    | 0   | 0            | 0   | 0               | 0   | 0             | 0   | 0                  | 0    | 3    | 3    | 0    | 0    | 0    | 0    |
| ÖK4                                                          | 2                                                                    | 0   | 2            | 0   | 3               | 0   | 0             | 0   | 0                  | 0    | 3    | 4    | 0    | 3    | 0    | 0    |
| ÖK5                                                          | 3                                                                    | 0   | 2            | 0   | 3               | 0   | 0             | 0   | 0                  | 0    | 3    | 4    | 0    | 3    | 0    | 0    |
| ÖK6                                                          | 0                                                                    | 0   | 2            | 0   | 3               | 0   | 0             | 0   | 0                  | 0    | 3    | 4    | 0    | 3    | 0    | 0    |
| ÖK7                                                          | 0                                                                    | 0   | 2            | 0   | 3               | 0   | 0             | 0   | 0                  | 0    | 3    | 4    | 0    | 3    | 0    | 0    |
| ÖK8                                                          | 0                                                                    | 0   | 2            | 0   | 3               | 0   | 0             | 0   | 0                  | 0    | 3    | 4    | 0    | 3    | 0    | 0    |
| ÖK9                                                          | 0                                                                    | 0   | 2            | 0   | 3               | 0   | 0             | 0   | 0                  | 0    | 3    | 4    | 0    | 3    | 0    | 0    |
| ÖK10                                                         | 0                                                                    | 0   | 0            | 0   | 0               | 0   | 0             | 0   | 0                  | 0    | 0    | 4    | 0    | 0    | 0    | 0    |
| <b>LO: Learning Objectives    PQ: Program Qualifications</b> |                                                                      |     |              |     |                 |     |               |     |                    |      |      |      |      |      |      |      |
| <b>Contribution Level:</b>                                   | <b>1 very low</b>                                                    |     | <b>2 low</b> |     | <b>3 Medium</b> |     | <b>4 High</b> |     | <b>5 Very High</b> |      |      |      |      |      |      |      |