| EXPERIMENTAL DESIGN |                                                         |                                                                                                                                                                                                   |                                                                           |  |  |  |  |  |  |
|---------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--|--|--|--|--|--|
| 1                   | Course Title:                                           | EXPERI                                                                                                                                                                                            | MENTAL DESIGN                                                             |  |  |  |  |  |  |
| 2                   | Course Code:                                            | END515                                                                                                                                                                                            | 3                                                                         |  |  |  |  |  |  |
| 3                   | Type of Course:                                         | Optional                                                                                                                                                                                          |                                                                           |  |  |  |  |  |  |
| 4                   | Level of Course:                                        | Second                                                                                                                                                                                            | Cycle                                                                     |  |  |  |  |  |  |
| 5                   | Year of Study:                                          | 1                                                                                                                                                                                                 |                                                                           |  |  |  |  |  |  |
| 6                   | Semester:                                               | 1                                                                                                                                                                                                 |                                                                           |  |  |  |  |  |  |
| 7                   | ECTS Credits Allocated:                                 | 7.50                                                                                                                                                                                              |                                                                           |  |  |  |  |  |  |
| 8                   | Theoretical (hour/week):                                | 3.00                                                                                                                                                                                              |                                                                           |  |  |  |  |  |  |
| 9                   | Practice (hour/week):                                   | 0.00                                                                                                                                                                                              |                                                                           |  |  |  |  |  |  |
| 10                  | Laboratory (hour/week):                                 | 0                                                                                                                                                                                                 |                                                                           |  |  |  |  |  |  |
| 11                  | Prerequisites:                                          | None                                                                                                                                                                                              |                                                                           |  |  |  |  |  |  |
| 12                  | Language:                                               | Turkish                                                                                                                                                                                           |                                                                           |  |  |  |  |  |  |
| 13                  | Mode of Delivery:                                       | Face to f                                                                                                                                                                                         | face                                                                      |  |  |  |  |  |  |
| 14                  | Course Coordinator:                                     | Prof. Dr.                                                                                                                                                                                         | SEDA ÖZMUTLU                                                              |  |  |  |  |  |  |
| 15                  | Course Lecturers:                                       | Yrd. Doç                                                                                                                                                                                          | Dr. Ali Yurdun Orbak                                                      |  |  |  |  |  |  |
| 16                  | Contact information of the Course Coordinator:          | 224-294                                                                                                                                                                                           | ludag.edu.tr<br>-2085<br>Mühendisliği Bölümü Görükle Bursa                |  |  |  |  |  |  |
| 17                  | Website:                                                |                                                                                                                                                                                                   |                                                                           |  |  |  |  |  |  |
| 18                  | Objective of the Course:                                | To convey the experimental design techniques to graduate students for them to design experiments to reach correct conclusions and make correct deductions in their scientific or applied studies. |                                                                           |  |  |  |  |  |  |
| 19                  | Contribution of the Course to Professional Development: |                                                                                                                                                                                                   |                                                                           |  |  |  |  |  |  |
| 20                  | Learning Outcomes:                                      |                                                                                                                                                                                                   |                                                                           |  |  |  |  |  |  |
|                     |                                                         | 1                                                                                                                                                                                                 | Ability to identify and solve real-life problems that contain uncertainty |  |  |  |  |  |  |
|                     |                                                         | 2                                                                                                                                                                                                 | Performing analytical studies for the quality improvement concept         |  |  |  |  |  |  |
|                     |                                                         | 3                                                                                                                                                                                                 | Ability to design experimentss                                            |  |  |  |  |  |  |
|                     |                                                         | 4                                                                                                                                                                                                 | Ability to analyze collected data from designed or undesigned experiments |  |  |  |  |  |  |
|                     |                                                         | 5                                                                                                                                                                                                 |                                                                           |  |  |  |  |  |  |
|                     |                                                         | 6                                                                                                                                                                                                 |                                                                           |  |  |  |  |  |  |
|                     |                                                         | 7                                                                                                                                                                                                 |                                                                           |  |  |  |  |  |  |
|                     |                                                         | 8                                                                                                                                                                                                 |                                                                           |  |  |  |  |  |  |
|                     |                                                         | 9                                                                                                                                                                                                 |                                                                           |  |  |  |  |  |  |
|                     |                                                         | 10                                                                                                                                                                                                |                                                                           |  |  |  |  |  |  |
| 21 Course Content:  |                                                         |                                                                                                                                                                                                   |                                                                           |  |  |  |  |  |  |
| 10/                 | <del>-</del> 1                                          | Co                                                                                                                                                                                                | ourse Content:                                                            |  |  |  |  |  |  |
|                     | Theoretical                                             |                                                                                                                                                                                                   | Practice                                                                  |  |  |  |  |  |  |
| 1                   | Introduction to Experimental Design                     |                                                                                                                                                                                                   |                                                                           |  |  |  |  |  |  |
| 2                   | Statistical Analysis Methods Review                     |                                                                                                                                                                                                   |                                                                           |  |  |  |  |  |  |
| 3                   | Introduction to Regression                              |                                                                                                                                                                                                   |                                                                           |  |  |  |  |  |  |
| 4                   | Advanced Regression Analysis                            |                                                                                                                                                                                                   |                                                                           |  |  |  |  |  |  |

| 6                 | Rando                                                                        | n block  | S     |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |
|-------------------|------------------------------------------------------------------------------|----------|-------|------|-------|-------|--------|---------------------------------------------------------------------------------------------|----------------|-------|-------|---------|-------|----------|--------|------|--|
| 7                 | Random blocks  Latin Squares and Related Designs                             |          |       |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |
| 8                 | Repeating courses and midterm exam                                           |          |       |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |
| 9                 | Introduction to Factorial Design                                             |          |       |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |
| 10                | ŭ                                                                            |          |       |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |
|                   | Factorial Designs for factors with two levels                                |          |       |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |
| 11                | Factorial Designs for factors with three and more levels                     |          |       |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |
| 12                | Nested and cross-over designs                                                |          |       |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |
| 13                | Taguchi Method                                                               |          |       |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |
| 14                | Response Surface Metholodolgy                                                |          |       |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |
| 22                |                                                                              |          |       |      |       |       |        | Montgomery, D. C. "Design and Analysis of Experiments", Sixth Ed., John Wiley & Sons, 2004. |                |       |       |         |       |          |        |      |  |
| 23                | Assesment                                                                    |          |       |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |
| TERM L            | LEARNING ACTIVITIES                                                          |          |       |      | N     | IUMBE | W      | WEIGHT                                                                                      |                |       |       |         |       |          |        |      |  |
| Midtern           | n Exam                                                                       |          |       |      |       | 1     |        | 2                                                                                           | 20.00          |       |       |         |       |          |        |      |  |
| Quiz 3            |                                                                              |          |       |      | 3     | 3     | 30.00  |                                                                                             |                |       |       |         |       |          |        |      |  |
| Home \            | Home work-project 5                                                          |          |       |      |       | 5     | 2      | 20.00                                                                                       |                |       |       |         |       |          |        |      |  |
| Final E           | xam                                                                          |          |       |      |       | 1     |        | 3                                                                                           | 30.00          |       |       |         |       |          |        |      |  |
| Total             |                                                                              |          |       |      |       |       | 1      | 100.00                                                                                      |                |       |       |         |       |          |        |      |  |
| Activit           | Activites                                                                    |          |       |      |       |       |        | Number Duration (hour) Total V<br>Load (h                                                   |                |       |       |         |       |          |        |      |  |
| Theore            | Theoretical                                                                  |          |       |      |       |       |        |                                                                                             |                |       | 3.00  | 3.00    |       |          | 42.00  |      |  |
| Practic           | Practicals/Labs                                                              |          |       |      |       |       |        | 11_                                                                                         | 0              |       |       | 0.00    | 0.00  |          |        | 0.00 |  |
| weasu<br>Self sti | Measurement and Evaluation Techniques Used in the Self study and preperation |          |       |      |       |       | е      | 14                                                                                          |                |       | 8.50  |         |       | 119.00   |        |      |  |
|                   | Homeworks                                                                    |          |       |      |       |       |        | 5                                                                                           |                |       | 10.00 |         |       | 50.00    |        |      |  |
| Project           | Projects                                                                     |          |       |      |       |       |        | 0                                                                                           |                |       | 0.00  | 0.00    |       |          | 0.00   |      |  |
| Field S           | Field Studies                                                                |          |       |      |       |       |        | 0                                                                                           |                |       | 0.00  |         |       | 0.00     |        |      |  |
| Midtern           | Aidterm exams                                                                |          |       |      |       |       |        | 1                                                                                           |                |       | 2.00  |         |       | 2.00     |        |      |  |
| Others            | hers                                                                         |          |       |      |       |       |        | 3                                                                                           |                |       | 4.00  | 4.00    |       |          | 12.00  |      |  |
| Final E           | al Exams                                                                     |          |       |      |       |       |        | 1                                                                                           |                |       | 3.00  | 3.00    |       |          | 3.00   |      |  |
| Total W           | ork Loa                                                                      | ıd       |       |      |       |       |        |                                                                                             |                |       |       |         |       |          | 228.00 |      |  |
| Total w           | ork load                                                                     | l/ 30 hr |       |      |       |       |        |                                                                                             |                |       |       |         |       |          | 7.60   |      |  |
| ECTS (            | Credit o                                                                     | the Co   | urse  |      |       |       |        |                                                                                             |                |       |       |         |       |          | 7.50   |      |  |
| 25                |                                                                              |          | CON   | TRIE | UTIO  | N O   |        |                                                                                             | NING<br>ALIFIC |       | OME:  | S TO I  | PROC  | GRAM     | IME    |      |  |
|                   | PQ                                                                           | 1 PQ2    | PQ3   | PQ4  | PQ5   | PQ6   | PQ7    | PQ                                                                                          | 8 PQ9          | PQ1   | PQ11  | PQ12    | PQ1   | PQ14     | PQ15   | PQ16 |  |
| ÖK1               | 0                                                                            | 5        | 5     | 0    | 0     | 0     | 0      | 5                                                                                           | 5              | 0     | 5     | 5       | 0     | 0        | 0      | 0    |  |
| ÖK2               | 0                                                                            | 5        | 5     | 0    | 0     | 0     | 0      | 5                                                                                           | 5              | 0     | 5     | 5       | 0     | 0        | 0      | 0    |  |
| ÖK3               | 0                                                                            | 5        | 5     | 0    | 0     | 0     | 0      | 5                                                                                           | 0              | 0     | 5     | 5       | 0     | 0        | 0      | 0    |  |
| ÖK4               | 0                                                                            | 5        | 5     | 0    | 0     | 0     | 0      | 5                                                                                           | 0              | 0     | 5     | 5       | 0     | 0        | 0      | 0    |  |
|                   |                                                                              |          | LO: L | earr | ing C | bje   | ctives | 5                                                                                           | PQ: P          | rogra | m Qu  | alifica | tions | <u> </u> |        | •    |  |
|                   |                                                                              |          |       |      |       |       |        |                                                                                             |                |       |       |         |       |          |        |      |  |

5

Single factor experiments and ANOVA

| Contrib | 1 very low | 2 low | 3 Medium | 4 High | 5 Very High |
|---------|------------|-------|----------|--------|-------------|
| ution   |            |       |          |        |             |
| Level:  |            |       |          |        |             |