

# ELECTROMECHANICAL ENERGY CONVERSION

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| <b>1</b>  | Course Title:                                           | ELECTROMECHANICAL ENERGY CONVERSION                                                                                                                                                                                       |
| <b>2</b>  | Course Code:                                            | EEM3504                                                                                                                                                                                                                   |
| <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:                                               | 6                                                                                                                                                                                                                         |
| <b>7</b>  | ECTS Credits Allocated:                                 | 4.00                                                                                                                                                                                                                      |
| <b>8</b>  | Theoretical (hour/week):                                | 3.00                                                                                                                                                                                                                      |
| <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. MURAT UYAR                                                                                                                                                                                                       |
| <b>15</b> | Course Lecturers:                                       | Öğr.Gör.Dr. Sevim KURTULDU                                                                                                                                                                                                |
| <b>16</b> | Contact information of the Course Coordinator:          | muratuyar@uludag.edu.tr<br>Tel: (224) 294 0769<br>Adres: Elektrik-Elektronik Mühendisliği Bölümü 3. Kat, No: 322                                                                                                          |
| <b>17</b> | Website:                                                | <a href="http://ee.uludag.edu.tr/?page_id=7">http://ee.uludag.edu.tr/?page_id=7</a>                                                                                                                                       |
| <b>18</b> | Objective of the Course:                                | To gain knowledge and skills about basic magnetic principles, principles of energy conversion, structure of transformers and direct current machines and steady-state operation.                                          |
| <b>19</b> | Contribution of the Course to Professional Development: | To be able to follow innovations and apply them in the field by using the competence of collecting information, researching and analyzing them.                                                                           |
| <b>20</b> | Learning Outcomes:                                      |                                                                                                                                                                                                                           |
|           | <b>1</b>                                                | To be able to apply the theoretical and practical knowledge included in the basic electromagnetic and circuit theory courses in the solution of engineering problems in the field of electromechanical energy conversion. |
|           | <b>2</b>                                                | To know the structure, types of transformers and direct current machines and the basic properties of the materials used.                                                                                                  |
|           | <b>3</b>                                                | To be able to create electrical equivalent circuit models of transformers and direct current machines.                                                                                                                    |
|           | <b>4</b>                                                | To be able to design and set up experiments related to transformers and direct current machines, analyze and interpret the results.                                                                                       |
|           | <b>5</b>                                                |                                                                                                                                                                                                                           |
|           | <b>6</b>                                                |                                                                                                                                                                                                                           |
|           | <b>7</b>                                                |                                                                                                                                                                                                                           |
|           | <b>8</b>                                                |                                                                                                                                                                                                                           |
|           | <b>9</b>                                                |                                                                                                                                                                                                                           |
|           | <b>10</b>                                               |                                                                                                                                                                                                                           |
| <b>21</b> | Course Content:                                         |                                                                                                                                                                                                                           |
|           | <b>Course Content:</b>                                  |                                                                                                                                                                                                                           |
| Week      | Theoretical                                             | Practice                                                                                                                                                                                                                  |

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| 1                                                                | Basic magnetic relations, properties of magnetic materials, iron losses. |                        |
| 2                                                                | Inductance. Sinusoidal excitation and magnetizing current                |                        |
| 3                                                                | Magnetic circuits.                                                       |                        |
| 4                                                                | Transformers, structure of single phase transformer.                     |                        |
| 5                                                                | Equivalent circuit of transformer, drawing phasor diagrams               |                        |
| 6                                                                | Efficiency and voltage regulation in transformers. Auto transformers.    |                        |
| 7                                                                | Design principles of transformers.                                       |                        |
| 8                                                                | Midterm and general review                                               |                        |
| 9                                                                | Three phase transformers. Connection types and groups.                   |                        |
| 10                                                               | General principles and definitions of energy conversion                  |                        |
| 11                                                               | Structure and form of excitation of direct current (DC) machines         |                        |
| Activites                                                        |                                                                          |                        |
|                                                                  | Number                                                                   | Duration (hour)        |
| Theoretical                                                      |                                                                          | Total Work Load (hour) |
| 12                                                               | Losses and efficiency in DA machines                                     |                        |
| Practicals/Labs                                                  | 0                                                                        | 0.00                   |
| Self study/oversees                                              | 14                                                                       | 4.00                   |
| 14                                                               | Oversees control methods in DC                                           | 56.00                  |
| Homeworks                                                        | 2                                                                        | 9.00                   |
| 18                                                               |                                                                          | 18.00                  |
| Projects                                                         | 0                                                                        | 0.00                   |
| Field Studies                                                    | 0                                                                        | 0.00                   |
| Midterm exams                                                    | 2                                                                        | 2.00                   |
| Others                                                           | 0                                                                        | 0.00                   |
| Final Exams                                                      | 2                                                                        | 2.00                   |
| Total Work Load                                                  |                                                                          | 120.00                 |
| Total work load/ 30 hr                                           | Hill, 2003.                                                              | 4.00                   |
| ECTS Credit of the Course                                        |                                                                          | 4.00                   |
| 23                                                               | Assessment                                                               |                        |
| 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                 |

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| Measurement and Evaluation Techniques Used in the Course | Measurement and evaluation is carried out according to the principles of Bursa uludag University Associate and Undergraduate Education Regulation. |
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| <b>24</b> | <b>ECTS / WORK LOAD TABLE</b> |
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|--------------------------------------------------------------|----------------------------------------------------------------------|-----|-----|--------------|-----|-----|-----------------|-----|-----|---------------|------|------|--------------------|------|------|------|
| <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                                                          | 5                                                                    | 0   | 0   | 0            | 0   | 0   | 0               | 0   | 0   | 0             | 0    | 0    | 0                  | 0    | 0    | 0    |
| ÖK2                                                          | 0                                                                    | 5   | 0   | 0            | 0   | 0   | 0               | 0   | 0   | 0             | 0    | 0    | 0                  | 0    | 0    | 0    |
| ÖK3                                                          | 0                                                                    | 0   | 5   | 0            | 0   | 0   | 0               | 0   | 0   | 0             | 0    | 0    | 0                  | 0    | 0    | 0    |
| ÖK4                                                          | 0                                                                    | 0   | 0   | 5            | 0   | 0   | 0               | 0   | 0   | 0             | 0    | 0    | 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> |      |      |      |