Electromagnetic compatibility IS-FEE-20014W

Field of study: Electrical and Electronics Engineering

Level and form of study: Master's degree, full time

Course name: Electromagnetic compatibility

Course code: IS-FEE-20014W

Course type: Elective

Course form(s) and number of hours:
- Lecture: 15 hours
- Laboratory class: 15 hours
- Preparation for passing a lecture/an examination: 20 hours
- Preparation for practical classes: 20 hours
- Preparation of reports from laboratory classes: 20 hours
- Preparation a presentation on a specific topic: 20 hours

ECTS credits: 4

Total number of hours: 100


Testing of immunity of electrical and electronic equipment to electromagnetic disturbances (principles, stands, levels).

Testing of electromagnetic emission from electrical and electronic equipment (principles, stands, levels).

Testing of electromagnetic emission from electrical and electronic equipment (principles, stands, levels).

Testing of electromagnetic emission from electrical and electronic equipment (principles, stands, levels).

Testing of electromagnetic emission from electrical and electronic equipment (principles, stands, levels).

Students presentations on the specific topics.

Course objectives:
- To acquaint students with the sources of electromagnetic disturbances, how they affect technical objects and electronic and electrical equipment and systems, and the hazards they pose. To acquaint students with the legal requirements as well as the resulting technical recommendations in electromagnetic compatibility (EMC) of electrical and electronic equipment placed on the market. To familiarize students with selected EMC testing methods and equipment. To develop the skills of conducting selected basic and suplementary EMC tests and working with basic testing apparatus. To develop students' skills of proper elaboration, analysis and evaluation of the results of performed tests.

Other information about the course:
- Content of the course refers to the principles of sustainable development.
- The course is related to the scientific activity conducted at the University.

Student workload related to:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Total number of hours</th>
<th>Contact</th>
<th>Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation in lectures</td>
<td>15</td>
<td>15</td>
<td></td>
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<tr>
<td>Participation in other forms of activities</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Participation in an examination</td>
<td>0</td>
<td>0</td>
<td></td>
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<tr>
<td>Participation in consultations</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Completion of professional training</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Preparation for passing a lecture/an examination</td>
<td>5</td>
<td>5</td>
<td></td>
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<tr>
<td>Preparation for practical classes</td>
<td>16</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Preparation of reports from laboratory classes</td>
<td>24</td>
<td>24</td>
<td></td>
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<tr>
<td>Preparation a presentation on a specific topic</td>
<td>6</td>
<td>6</td>
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</table>

Total number of contact hours: 49
Total number of practical hours: 79
Total number of ECTS credits: 4

Expected discipline learning outcomes:

Knowledge: 2.0
Skills: 3.1
Social competence:

Objectives and framework content prepared by Assoc. Prof. Renata Markowska, DSc PhD Eng.

Implementation in the academic year 2024/2025

Lecture:
1. Introduction to electromagnetic compatibility (EMC), basic EMC problems, recommended literature.
2. The procedure for assessing the compliance with the EMC Directive, EMC standards.
3. Sources of electromagnetic disturbances, main parameters characterizing the disturbing signals.
4. The threats posed by various sources of electromagnetic disturbances.
5. The principles of the interfering effects of various signals, electromagnetic couplings.
6. Testing of immunity of electrical and electronic equipment to electromagnetic disturbances (principles, stands, levels).
7. Testing of immunity of electrical and electronic equipment to electromagnetic disturbances (principles, stands, levels).
8. Testing of immunity of electrical and electronic equipment to electromagnetic disturbances (principles, stands, levels).
9. Testing of immunity of electrical and electronic equipment to electromagnetic disturbances (principles, stands, levels).
10. Testing of electromagnetic emission from electrical and electronic equipment (principles, stands, levels).
11. Testing of electromagnetic emission from electrical and electronic equipment (principles, stands, levels).
12. Testing of electromagnetic emission from electrical and electronic equipment (principles, stands, levels).
13. Testing of electromagnetic emission from electrical and electronic equipment (principles, stands, levels).
15. Students presentations on the specific topics.

Laboratory classes:
1. Introduction, regulations of laboratory work, rules of safety and hygiene of work. - 3 hours
2. Surge generators - part 1. - 3 hours
3. Surge generators - part 2. - 3 hours
4. Testing the attenuation of various types of shields. - 3 hours
<table>
<thead>
<tr>
<th>Teaching methods (on-site classes)</th>
<th>Teaching methods (online classes)</th>
<th>Forms of crediting</th>
<th>Conditions of crediting</th>
<th>Outcome symbols</th>
<th>Expected learning outcomes</th>
<th>Expected learning outcomes defined for the field of study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information lecture with multimedia presentation</td>
<td>Information lecture with multimedia presentation</td>
<td>Written or oral exam with open questions; presentation on a specific topic; tests of preparation for exercises; students reports;</td>
<td>Positive assessment of each task of the exam; positive assessment of the presentation. Final grade is the arithmetic mean of partial grades.</td>
<td>Knowledge</td>
<td>the phenomena related to generation, propagation and effects of electromagnetic disturbances on electronic and electrical equipment and systems</td>
<td>Knowledge: the student knows and understands</td>
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<tr>
<td>Laboratory experiments</td>
<td>Laboratory experiments</td>
<td>Tests of preparation for exercises; students reports; observation of students work on exercises</td>
<td>Attendance to the classes; positive grades of the tests; positive grades of the reports. Final grade is the arithmetic mean of partial grades.</td>
<td>Social competence</td>
<td>the general requirements in the area of electromagnetic compatibility (EMC) of electrical and electronic equipment and systems; selected methods of EMC testing with relation to legal acts and technical standards</td>
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<td>Skills</td>
<td>plan and perform selected basic and complementary tests in the area of EMC; develop technical documentation on the implementation of these tests, including interpretation of the results</td>
<td>Skills: the student can</td>
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<td>Social competence</td>
<td>work individually and in a team, keeping the schedule and observing the rules of health and safety of work</td>
<td>Social competence: the student is ready to</td>
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<td>student is ready to work in a team, including coordinating the work of the team and the protection of intangible and legal property, as well as the expectations of the social environment</td>
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</tbody>
</table>

### Basic references

1. Sroka J.; Compendium on electromagnetic compatibility; Oficyna Wydawnicza Politechniki Warszawskiej; Warszawa, 2021.
5. Kodali V. P.; Engineering electromagnetic compatibility: principles, measurements, technologies and computer models; The Institute of Electrical and Electronics Engineers; New York, 2000.
Supplementary references