# SYLLABUS

**1. Course title:**

Theory of Electromagnetic Fields

**2. Code:**

ESKE102

**3. Cycle of study:**

1

**4. ECTS credits:**

6

**5. Type of course:**

(•) Mandatory ( ) Elective

**6. Prerequisites:**

[ESKE001] Fundamentals of Electrical Engineering I, [ESKE002] Fundamentals of Electrical Engineering II

**7. Class restrictions:**

**8. Duration / semester:**

1 3

**9. Weekly contact hours:**

9.1. Lectures: 3

9.2. Seminars: 1

9.3. Laboratory/Practice classes: 1

**10. Faculty:**

Faculty of Electrical Engineering

**11. Department/study program:**

Electrical Engineering and Computer Science

**12. Lecturer:**

Ph.D. Vlado Madžarević, full professor

**13. Lecturer's e-mail:**

vlado.madzarevic@untz.ba

**14. Web site:**

**15. Course aims:**

Enabling students for mathematical description of electromagnetic phenomena for systems of any size, shape and type of material in three-dimensional space and time. Acquiring skills of calculation and analysis of electromagnetic fields, power and energy, analytically and numerically using various software packages of practical tasks. Developing the scientific and engineering mindset.

**16. Learning outcomes:**

-developing knowledge of how simple fundamental equations for electromagnetic field, using the application of mathematical methods, resulting explanations for complex physical phenomena
- identification of meanings precise definition of individual physical quantities, in order to compute and measure them.
- develop the ability of independent problem solving based on the differential equations

**17. Course content:**

Presentation of the electromagnetic fields. Definitions of vector fields E and B and their sources. Singular density sources. Discontinuities in the field. Maxwell's equations in vacuum in differential and integral form. The electromagnetic field in the presence of substances, which is at rest. Conductor in the electric field. Dielectric in an electric field. The magnetization of the material. Model with amp currents. Model with magnetic charges and current density. Vector fields D and H. The electric and magnetic fluxes Φe and Φm. Maxwell's equations for vector fields E, B, D and H. Electromagnetic potentials. Wave equation. Integral equations to solve electromagnetic task. Retarded potentials. Energy and forces in electromagnetic field. Spatial forces and surface streeses. Vektor electromagnetic stress. The static electric field. Capacity. Static current field. Static magnetic field. Inductanse. Quasistatic field. Equations fields in phasor domain and quasistatic sinusoidal changing fields.

**18. Learning methods:**

Lectures using multimedia resources, calculation and laboratory exercises

**19. Assessment methods:**

Examination is performed in writing, orally and combined (written + oral)

**20. Assessment components:**

Rating exam is based on the total number of points a student earned by completing pre-exam and a final exam. The student can achieve a maximum of 100 points according to the following scale:
Test I 20
Test II 20
Tasks 5
Lab. exercise 5
Final exam 50

**21. Required reading list:**

Z. Haznadar, Ž. Štih: "Electromagnetism 1", Sarajevo, 1998
I. Kapetanovic, V. Madžarević, J. Smajic: "Selected Topics of calculus in the theory of electromagnetic fields", Tuzla, 1999
E. M. Purcell, "Electricity end Magnetism", Berkeley, 1965

**22. Web sources:**

**23. Applicable starting from the academic year:**

2016/2017

**24. Adopted in the Faculty/Academy session:**

04.04.2016