Reg No: FYGA22/20192

Faculty of Health, Science and Technology
Physics

# Syllabus

## Introduction to Physics for Electrical Engineering

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| **Course Code:** | FYGA22 |
| **Course Title:** | Introduction to Physics for Electrical Engineering<br>*Grundläggande fysik för elektroteknik* |
| **Credits:** | 7.5 |
| **Degree Level:** | Undergraduate level |
| **Progressive Specialisation:** | First cycle, has only upper-secondary level entry requirements (G1N) |

**Major Field of Study:**
ETA (Electrical Engineering)
FYA (Physics)
TKA (Engineering Physics)

**Course Approval**
The syllabus was approved by the Faculty of Health, Science and Technology 2019-03-13, and is valid from the Autumn semester 2019 at Karlstad University.

**Prerequisites**
General admission requirements plus either field-specific eligibility A8 (Physics 2, Chemistry 1, Mathematics 3c) or field-specific eligibility 8 (Physics B, Chemistry A, Mathematics D), or equivalent

**Learning Outcomes**
Upon completion of the course, students should be able to:
- use Newton's laws of motion and explain the general principles of kinematics,
- define energy and the energy principle,
- give an account of electric and magnetic fields and describe their applications, and
- give an account of the properties of a semiconductor and give examples of areas of use.

**Content**
- Motion in one and two dimensions and laws of motion: Position, speed, acceleration, kinetic equations, Newton's laws, gravitational force, friction, and models of analysis based on Newton's laws.
- Energy and the energy principle: Physical work, kinetic energy, the work-kinetic energy theorem, potential energy, changes in energy levels for conservative and non-conservative forces, effect.
- Electricity: Coulomb's law, special cases of Gauss's law, potential and capacitance, energy in capacitors, current and resistance, the concept of direct current circuits.
- Magnetism: Definition of magnetic fields, magnetic forces on an electric conductor, torque on a current loop, special cases of Biot-Savart's law, Ampère's law, and Gauss's law.
- Electromagnetism: Special cases of Faraday's law, self inductance, mutual inductance, energy in inductors, oscillation in a circuit with condensators and inductors.

**Reading List**
See separate document.

**Examination**
Assessment is based on a written exam.

**Grades**
One of the grades Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course. For Engineering students, one of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), U (Fail) is awarded in the examination of the course.

**Quality Assurance**
Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

**Course Certificate**
A course certificate will be provided upon request.

**Additional information**
The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.