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| **Course Title:** Electrodynamics | **Number of Units:** 1 |
| **SSD:** ING/IND-31 | **CFU:** 9 |
| **Course aims:** The aim of the course is to attain a general understanding of Classical Electrodynamics with a special attention to the mathematical aspects of the theory. A central theme in the course is the description, within the continuum approach, of the interactions of electromagnetic fields and material media. | |
| **Course Description** Maxwell equations (eqs.) in vacuum and in presence of materials. Electromagnetic (e.m.) waves and radiation. Lagrangian formulation. Lorentz invariance. Balance of e.m. momentum, e.m. energy. Uniqueness of solution. Coupling of Maxwell's eqs. and thermodynamics of continuous media. Classification of media. Stationary and quasi-stationary fields. Mathematical aspects of stationary field equations. Conservative and solenoidal fields, Helmholtz decomposition, Tellegen theorem. Potential theory: differential and integral formulations. Special functions. Energy and forces in quasi stationary electromagnetic fields. Formulation of electrodynamics in terms of energy. Elements of electrodynamics in presence of ferromagnetic materials, dielectric materials, superconductors and semiconductors. Examples of e.m. systems relevant to applications. | |
| **Assumed Background:** | |
| **Assessment methods:** Oral interview and discussion of a case study | |