Course Syllabus for
Smart and Sustainable Industry PhD Program
(years 2024-25 /2025-26)

Course title	**Advanced Fiber Optic Technologies for Biosensing**
Scientific Discipline Sector	ING-INF/01
Hours of instruction	20 hours
CFU	2 CFU
Semester	First
Goal	The goal of this course is to provide a theoretical and simulation-oriented introduction to biosensing with advanced optical fiber technologies. After a brief introduction to the optical fiber's characteristics, the course will focus on a few fiber optic architectures and their working principle for biosensing. This course will also introduce the basic parameters to assess the fiber optic sensors' performance with real-world applications. A few demonstrations of the sensor design will be performed through the simulation tool Comsol Multiphysics and Matlab coding to guide the students for the final project.
Syllabus	1) Introduction to the optical fibers from the Maxwell equations to provide basic concepts including vector and scalar modes. 2) Standard optical fiber materials and working principle of optical fibers for Biosensing. 3) Different fiber optic sensors e.g. photonic crystals, ring resonators and surface plasmon resonance will be introduced with the sensing enhancement principle. 4) The important parameters will be introduced to assess the sensing performance with real world application e.g. protein detection, remote sensing. 5) Few demonstrations will be performed with Comsol and Matlab to provide hands-on experience to the students and prepare them for the final project.
Bibliography	Slides will be provided during the lessons
Examination method	Final project