Basic/Essential Course Information	
Course title	Laboratory of Photonics
Degree Course title	Physics
ECTS	6
Compulsory attendance	No
Course teaching language	English

Teacher	Maurizio Dabbicco	maurizio.dabbicco@uniba.it

ECTS Details	Disciplinary area	SSD	ECTS
	Characterizing	FIS/03	6

Course schedule	Period	Year	lesson type
	2 nd semester	1st	Lessons (32h) Lab (30h)

Time management	Total hours	in-class/in-lab	out-of-class study hours
	150	62	88

Course calendar	Starting date	Ending date
	First week of March	Last week of May

Syllabus	
Objectives	*Skills in laser beams characterization and management, both on theoretical and practical basis.* *Knowledge of light propagation issues in free-space and confined structures.*
Prerequisites	*Electromagnetism and waves, ray optics, bases of crystal symmetry and electronic energy levels in atomic, molecular and condensed matter, laser fundamentals, differential calculus and complex functions*
Expected learning outcomes	*• Knowledge and understanding* *The properties of Gaussian beam and the way to characterize it.* *Statistical properties of light. Materials' design tools for tailoring optical properties.* *• Knowledge and comprehension skills applied* *How to measure laser beam physical parameters.* *How to modify laser beam physical parameters.* *How to calculate propagation of laser beams in linear optical materials.* *• Autonomy of judgment* *Criteria for choosing optical materials and components.* *Criteria for choosing instrumentation for light beams characterization.* *• Communication skills* *Writing extended laboratory reports.* *Preparing and presenting tutorial-type presentations.* *• Ability to learn* *Critical review of laboratory results.*
Course contents – summary	*Optical materials. Principles and instrumentation for beam characterization and shaping. Beam propagation methods.*
Course content – detailed	*Lectures -* *Linear photonics: optical materials (glasses, molecular crystals, dielectrics, semiconductors, metamaterials), optical components (lenses, lens systems,*

	mirrors, coatings, polarization optics, modulators), optical propagation in free-space and in transparent media (matrix optics, beam optics, Fourier optics). *Integrated photonics: resonators, wave guide modes, photonic crystals, basic components of optical circuits.* *Coherent photonics: statistical models of light, classical interference, optical feedback interferometry.* *Laboratory practice -* *Laser Beam characterization and shaping.* *Interference and diffraction.* *Optical Feedback Interferometry*
Course content – textbooks	*Saleh, Teich, Fundamentals of Photonics, Wiley.* *Hecht, Optics, Addison-Wesley.* *Donati, Electro-Optical Instrumentation, Prentice Hall PRT.*
Notes	*Selected chapters*
Teaching methods	*Lectures in the teaching room with the aid of a laptop and a projector.* *Laboratory activity supervised.*
Assessment % of final mark	*Mid-term test (20%), Lab reports (30%), Final project (50%)*
Evaluation criteria	*• Knowledge and understanding* *Minimum: the properties of Gaussian beam and the way to characterize it, classification and usage of optical materials.* *Intermediate: materials' design tools for tailoring optical properties.* *Optimal: maths of wave propagation in transparent media.* *• Knowledge and comprehension skills applied* *Minimum: critical analysis and accurate presentation of laboratory activity* *Intermediate: comprehensive review of state-of-art* *Optimal: comparison of experimental data with numerical simulations* *• Autonomy of judgment* *Minimum: correct estimation of experimental uncertainties.* *Intermediate: motivated choice of materials and components for the purpose.* *Optimal: identification of the optimal setup for a given measurement.* *• Communication skills* *Minimum: compliance with timing and template of reports and presentation.* *Intermediate: cogency of argumentation.* *Optimal: skillful presentation of state-of-art and perspective studies.*