

QUARMEN “Erasmus Mundus Joint Master” programme

Academic programme

QUARMEN Academic Programme	
Year 1 (60 ECTS)	
Semester 1 (30 ECTS)	
Rome – La Sapienza University Condensed matter physics (6 ECTS) Physics Laboratory 1 (6 ECTS) Introduction to quantum field theory (6 ECTS) Computing methods for physics (3 ECTS) Non-linear and quantum optics (6 ECTS) Language course (3 ECTS)	
Winter School	
Semester 2 (30 ECTS)	
Paris Saclay University Quantum effects at the macroscale (6 ECTS) Advanced mathematics for physics (3 ECTS) Machine learning for Quantum Technology (3 ECTS) Nanomaterials and electronics applications (3 ECTS) Quantum Hardware (3 ECTS) Language course (3 ECTS) Internship (6 ECTS) Option (3 ECTS): Research project Other courses	University of Porto Introduction to quantum information (6 ECTS) Quantum materials (6 ECTS) High performance computing (3 ECTS) Computational complexity (6 ECTS) Language course (3 ECTS) Options (6 ECTS): Sensing and signal analysis Quantum and statistical field theory Advanced computer architectures Ms Gavkhar Shamsiddinova Internship
Year 2 (60 ECTS)	
Summer School	
Semester 3 (30 ECTS)	
Paris-Saclay University Quantum Optics - Quantum Materials – Nanoscience <u>Common courses</u> (15 ECTS) Physics of Quantum Information: qubits, entanglement (3) Fundamentals of micro and nanofabrication (3) Lab project (optics/ nanofabrication / analysis) (6) Introduction to 2nd quantization: from q. optics solids (3) <u>options: at least 15 ECTS, among (3 ECTS each):</u> Advanced micro and nanofabrication Integrated optics and nanophotonics Solid state devices Quantum communication Quantum sensing Quantum transport Physics experiments in Quantum Technologies Topology Quantum dynamics of many-body systems Nano-medicine and nano-toxicology Biophotonics	University of Toronto Quantum information - Quantum Optics - Cold Atoms <u>Courses</u> (30 ECTS = 2.0 FCE) 4 courses to be chosen among (7,5 ECTS each = 0,5 FCE): <i>Specialized:</i> Quantum Computing Quantum Information Theory Quantum Algorithms Many-Body Physics Quantum Measurement Special Topics in Quantum Optics <i>Foundations:</i> Quantum Theory of Solids Statistical Mechanics Quantum Optics Laser Physics <i>Professional development:</i> Scientific Communication
Semester 4 (30 ECTS)	
Research Internship and Master's Thesis	