MSc COURSE IN ***MATERIALS SCIENCE & NANOTECHNOLOGY*** 2025-2026

5 COMMON FUNDAMENTAL COURSES

Semester I

- **SOLID STATE PHYSICS**
- **MATERIALS SPECTROSCOPY AND MICROSCOPY**
- **THERMODYNAMICS AND KINETICS OF MATERIALS**
- **STRATEGIES FOR MATERIALS SYNTHESIS**
- **MATH. METHODS FOR MATER. SCIENCE**

Semester II

TRACK A
FUNCTIONAL MATERIALS

- **2** Elective compulsory courses (12 credits) ***MATERIALS*** *area*
- **1** Elective compulsory course (6 credits) ***APPLICATIONS*** area
- **1** Conditional Elective Course (6 credits) Physics & Chemistry of Matter
- **1** Elective compulsory course (6 credits) ***MATERIALS ENGINEERING*** area
- **3** Free Elective courses (18 redits) **ALL COURSES, ANY AREAS**

TRACK B
MATERIALS FOR NANOTECHNOLOGY

- **1** Elective compulsory courses (12 credits) ***MATERIALS*** *area*
- **2** Elective compulsory course (6 credits) ***NANOSYSTEMS*** area
- **1** Elective compulsory course (6 credits) ***APPLICATIONS*** area
- **1** compulsory course (6 CFU) ***MATERIALS ENGINEERING*** area
- **3** Free Elective courses (18 credits) **ALL COURSES, ANY AREAS**

TRACK C
MATERIALS FOR ENERGY

- **1** Elective compulsory courses (6 redits) ***MATERIALS*** area
- **3** Compulsory course (18 credits) ***ENERGY*** area
- **1** Elective compulsory course (6 credits) ***MATERIALS ENGINEERING*** area
- **3** Free Elective courses (18 credits) **ALL COURSES, ANY AREAS**

TRACK D
MATERIALS FOR DIGITAL & QUANTUM TECH.

- **2** Elective compulsory courses (12 credits) ***MATERIALS*** area
- **2** Elective compulsory course (12 credits) ***QUANTUM SYSTEMS*** area
- **1** Elective compulsory course (6 credits) ***MATERIALS ENGINEERING*** area
- **3** Free Elective courses (18 redits) **ALL COURSES, ANY AREAS**

Communication skills (3 credits) + Internship (3 credits – including Scientific Literacy) + THESIS (30 credits) → **FINAL DEFENSE**

ALL TRACKS MANDATORY FUNDAMENTAL COURSES

5 MATHEMATICAL METHODS FOR MATERIALS SCIENCE – THERMODYNAMICS AND KINETICS OF MATERIALS – SOLID STATE PHYSICS – MATERIALS SPECTROSCOPY AND MICROSCOPY – STRATEGIES FOR MATERIALS SYNTHESIS

TRACK A
Functional Materials
ELECTIVE COURSES

2 ***MATERIALS*** *area*
- CHEMISTRY OF INORGANIC MATERIALS
- CHEMISTRY OF MOLECULAR MATERIALS
- PHYSICAL CHEMISTRY OF SOLIDS
- PHYSICS OF SEMICONDUCTORS
- METALS SCIENCE AND SUSTAINABILITY
- ADVANCED SOLID STATE PHYSICS
- COMPUTATIONAL MATERIALS SCIENCE
- THEORY AND METHODS OF SPECTROSCOPY

1 ***APPLICATIONS*** area
- CHEMISTRY & TECHNOLOGY OF POLYMERS & INDUSTRIAL APPLICATIONS
- APPLICATIONS OF MATERIALS FOR IONIZING RADIATION DETECTION
- LOW ENVIRONMENTAL IMPACT MATERIALS AND PROCESSES
- MOLECULAR ELECTRONICS AND PHOTONICS
- QUANTUM PHOTONICS

1 *1 FURTHER ELECTIVE COURSE OF*

MATERIALS *area*
THEORY & MODELS area
NANOSYSTEMS area
ENERGY area
QUANTUM SYSTEMS area
APPLICATIONS area

1 ***MATERIALS ENGINEERING*** area
- ADVANCED FUNCTIONAL POLYMERS
- ENGINEERED NANOMATERIALS
- QUANTUM ELECTRONICS

3 3 Free Elective courses (18 credits)
ALL COURSES, ANY AREAS

TRACK B
Materials for Nanotech
ELECTIVE COURSES

1 ***MATERIALS*** *area*
- CHEMISTRY OF INORGANIC MATERIALS
- CHEMISTRY OF MOLECULAR MATERIALS
- PHYSICAL CHEMISTRY OF SOLIDS
- PHYSICS OF SEMICONDUCTORS
- METALS SCIENCE AND SUSTAINABILITY
- ADVANCED SOLID STATE PHYSICS
- COMPUTATIONAL MATERIALS SCIENCE
- THEORY AND METHODS OF SPECTROSCOPY

1 ***APPLICATIONS*** area
- CHEMISTRY & TECHNOLOGY OF POLYMERS & INDUSTRIAL APPLICATIONS
- APPLICATIONS OF MATERIALS FOR IONIZING RADIATION DETECTION
- LOW ENVIRONMENTAL IMPACT MATERIALS AND PROCESSES
- MOLECULAR ELECTRONICS AND PHOTONICS
- QUANTUM PHOTONICS

2 ***NANOSYSTEMS*** area
- NANOTECHNOLOGY & INNOVATION
- NANOCHEMISTRY AND NANOPOROUS MATERIALS & NANOMEDICINE
- PHYSICS OF SOFT MATTER NANOSTRUCTURES
- FABRICATION AND CHARACTERIZATION OF NANO & QUANTUM MATERIALS

1 ***MATERIALS ENGINEERING*** area
- ENGINEERED NANOMATERIALS
- QUANTUM ELECTRONICS

3 3 Free Elective courses (18 credits)
ALL COURSES, ANY AREAS

TRACK C
Materials for Energy
ELECTIVE COURSES

1 ***MATERIALS*** *area*
- CHEMISTRY OF INORGANIC MATERIALS
- CHEMISTRY OF MOLECULAR MATERIALS
- PHYSICAL CHEMISTRY OF SOLIDS
- PHYSICS OF SEMICONDUCTORS
- METALS SCIENCE AND SUSTAINABILITY

3 ***ENERGY*** area
- FUNDAMENTALS OF ELECTROCHEMISTRY FOR ENERGY STORAGE
- CATALYSIS FOR ENERGY AND THE ENVIRONMENT
- MODELS AND MATERIALS FOR ELECTROCHEMICAL ENERGY GENERATION AND CONVERSION
- ENERGETICS

1 ***MATERIALS ENGINEERING*** area
- PHOTOVOLTAICS & OTHER RENEWABLE ENERGY TECHNOLOGIES

3 3 Free Elective courses (18 credits)
ALL COURSES, ANY AREAS

TRACK D
Materials for Digital&Quantum Tech
ELECTIVE COURSES

2 ***MATERIALS*** *area*
- PHYSICAL CHEMISTRY OF SOLIDS
- PHYSICS OF SEMICONDUCTORS
- COMPUTATIONAL MATERIALS SCIENCE
- METALS SCIENCE AND SUSTAINABILITY

2 ***QUANTUM SYSTEMS*** area
- FABRICATION AND CHARACTERIZATION OF NANO & QUANTUM MATERIALS
- QUANTUM PHOTONICS
- NANOTECHNOLOGY & INNOVATION
- ADVANCED SOLID STATE PHYSICS

1 ***MATERIALS ENGINEERING*** area
- PHYSICS AND TECHNOLOGY OF ELECTRONIC DEVICES
- QUANTUM ELECTRONICS
- APPLIED QUANTUM TECHNOLOGY
- THEORY OF QUANTUM INFORMATION & QUANTUM TECHNOLOGY

3 3 Free Elective courses (18 credits)
ALL COURSES, ANY AREAS

ALL TRACKS MANDATORY INTEGRATIVE ACTIVITIES

COMMUNICATION SKILLS (3 credits)
- ITALIAN LANGUAGE (A1 Level) - Foreign students
- English Language (C1 level) or other language (B2 level) or Lab of Sci English- Italian students

INTERNSHIP (3 credits)
- Certification of Scientific Literacy by UNIMIB Library
- Training for the Master Thesis activity

THESIS (30 credits)