MASTER DUAL DEGREE IN MATERIALS SCIENCE
– SUSTAINABLE MATERIALS –

2022-2023

UNIMIB (1st year) - KU Leuven

(GREEN) – **courses to be attended at UNIMIB** → to be included in the Plan of Study
(BLUE) – **courses to be attended at KU-Leuven** → to be declared in the Erasmus Learning Agreement (LA)
(YELLOW) – **UNIMIB courses NOT to be attended** but to be included in the Plan of Study and in LA for transferring KU Leuven ECTS to UNIMIB
(GREY) – **KU LEUVEN courses NOT to be attended** which will be registered in the KU LEUVEN Plan of Study when the Transcript of Records of exams taken at UNIMIB will be transferred to KU Leuven

DEADLINES

1. Students must secure at least 12 ECTS by the end of March 2023 to have the EIT grant.
2. Students must obtain at least 36 ECTS by the end of September 2023 not to be dropped out from the dual degree track and moved to the normal UNIMIB track.
3. Students must secure at least 48 ECTS to have the MSc Thesis topic assigned by KU Leuven Faculty (procedure for assignment starts from July 2023 and cannot be delay after the first week of November 2023).

MANDATORY COURSES (36 ECTS)

5 COURSES		TYPE	ECTS	year	SEM
UNIMIB	KU LEUVEN				
FUNCTIONAL ANALYSIS	Project Work & Problem Solving – Part I& Part II (3 ECTS + 3 ECTS)	SUPPLEMENTARY	6	1	1
SOLID STATE PHYSICS	Materials Modelling & Simulation Techniques (6 ECTS) + Physical and Mechanical Properties of Polymers (2 ECTS of 3 ECTS)	CORE - Physics and Chemistry	8	1	1-2
PHYSICAL CHARACTERIZATION OF MATERIALS WITH LABORATORY	Materials Characterization techniques I (6 ECTS) + Physical and Mechanical Properties of Polymers (1 ECTS of 3 ECTS) + Design and analysis of experimentation (1 ECTS of 3 ECTS)	CORE - Physics and Chemistry	8	1	1-2
THERMODYNAMICS AND KINETICS OF MATERIALS	Advanced Metal Processing and Case Studies (6 ECTS)	CORE - Physics and Chemistry	6	1	1
APPLIED PHYSICAL CHEMISTRY WITH LABORATORY	Ceramic and Powder Metallurgy (6 ECTS) + Design and analysis of experimentation (2 ECTS of 3ECTS)	CORE - Physics and Chemistry	8	1	1-2

THREE MANDATORY COURSES FROM THE FOLLOWING SETS, ONE PER AREA (18 ECTS)

MATERIALS AREA (PHYSICS)

1 COURSE		TYPE	ECTS	year	SEM
~~PHYSICS OF SEMICONDUCTORS~~		~~CORE - Physics and Chemistry~~	~~6~~	~~1~~	~~2~~
PHYSICS OF HOMOGENEOUS AND NANOSTRUCTURED DIELECTRICS	Materials physics and technology for nanoelectronics (6 ECTS)	CORE - Physics and Chemistry	6	1	2
~~MOLECULAR ELECTRONICS AND PHOTONICS~~		~~CORE - Physics and Chemistry~~	~~6~~	~~1~~	~~2~~

MATERIALS AREA (CHEMISTRY)

1 COURSE		TYPE	ECTS	year	SEM
~~CHEMISTRY OF INORGANIC MATERIALS~~		~~CORE - Physics and Chemistry~~	~~6~~	~~1~~	~~1~~
PHYSICAL CHEMISTRY OF SOLID STATE AND SURFACES	Surface Science & Engineering (6 ECTS)	CORE - Physics and Chemistry	6	1	2
~~CHEMISTRY OF MOLECULAR MATERIALS~~		~~CORE - Physics and Chemistry~~	~~6~~	~~1~~	~~2~~

APPLICATIONS AREA (TECHNOLOGY)

1 COURSE		TYPE	ECTS	year	SEM
~~CHEMISTRY AND TECHNOLOGY OF POLYMERS AND INDUSTRIAL APPLICATIONS~~		~~CORE - Physics and Chemistry~~	~~6~~	~~1~~	~~2~~
LOW ENVIRONMENTAL IMPACT MATERIALS AND PROCESSES	Sustainable Materials Management (3 ECTS) + Resource Recovery and Recycling (3 ECTS)	CORE - Physics and Chemistry	6	1	2
~~PHYSICS AND TECHNOLOGY OF ELECTRONIC DEVICES WITH LABORATORY~~		~~CORE - Physics and Chemistry~~	~~6~~	~~2~~	~~1~~

ONE MANDATORY COURSE OUT THE FOLLOWING ONES (6 ECTS)

MATERIALS AREA (APPLICATIONS)

1 COURSE		TYPE	ECTS	year	SEM
METALS SCIENCE AND SUSTAINABILITY	Metals: production & recycling (6 ECTS)	SUPPLEMENTARY	6	1	1
~~SURFACES AND INTERFACES~~		SUPPLEMENTARY	6	1	2
~~RADIATION MATTER INTERACTION~~		SUPPLEMENTARY	6	1	2
*FUNDAMENTALS OF QUANTUM MECHANICS FOR MATERIALS SCIENTISTS		SUPPLEMENTARY	6	1	1
*BASIC CHEMISTRY FOR MATERIALS SCIENCE		SUPPLEMENTARY	6	1	1

* students with BSc degrees different from Materials Science who need to fill a gap in physics and/or chemistry can attend these courses. However, these courses cannot be included in the plan of study.

ONE MANDATORY COURSE FROM THE FOLLOWING ONES (6 ECTS)

MATERIALS AREA (NANOSCIENCE)

COURSE		TYPE	ECTS	year	SEM
NANOTECHNOLOGY AND INNOVATION	Nanomaterials for Nanoelectronics (3 ECTS) + Advanced Ceramic Materials (3 ECTS)	CORE - engineering	6	2	1
ENGINEERED NANOMATERIALS		CORE - engineering	6	2	1
~~QUANTUM ELECTRONICS~~		~~CORE - engineering~~	~~6~~	~~2~~	~~1~~

ONE MANDATORY COURSE OUT OF THE FOLLOWING ONES (6 ECTS)

MATERIALS AREA (APPLICATIONS)

1 COURSE		TYPE	ECTS	year	SEM
~~SYNTHESIS AND SPECIAL ORGANIC TECHNIQUES IN MATERIALS CHEMISTRY~~		~~SUPPLEMENTARY~~	~~6~~	~~2~~	~~1~~
~~STATISTICAL THERMODYNAMICS OF MATERIALS~~		~~SUPPLEMENTARY~~	~~6~~	~~2~~	~~1~~
~~MATERIALS AND DEVICES FOR ENERGY ENGINEERING~~		SUPPLEMENTARY	6	2	1
PHYSICS AND TECHNOLOGY OF ELECTRONIC DEVICES WITH LABORATORY	Materials Physics and Technology for Nanoelectronics (6 ECTS)	SUPPLEMENTARY	6	1	2
~~QUANTUM MATERIALS SYNTHESIS~~		~~SUPPLEMENTARY~~	~~6~~	~~2~~	~~2~~

* the course MATERIALS AND DEVICES FOR ENERGY ENGINEERING – formally offered in the 2nd year of the normal track – is part of the 1st year SUMA track: it can be included in the plan of study by selecting it among the elective courses.

OTHER ACTIVITIES (48 ECTS)

ELECTIVES COURSES (12 ECTS)		**TYPE**	**ECTS**	**year**	**SEM**
MATERIALS AND DEVICES FOR ENERGY ENGINEERING (6 ECTS – at UNIMIB)	Engineering and Entrepreneurship (6 ECTS	TO BE CHOSEN FREELY BY UNIMIB STUDENT (art.10, comma 5, lettera a)	12	1-2	1-2
CHEMISTRY AND TECHNOLOGY OF POLYMERS AND INDUSTRIAL APPLICATIONS (6 ECTS)	Innovation Management and Strategy (6 ECTS)				

		TYPE	**ECTS**	**year**	**SEM**
MASTER THESIS		MASTER THESIS (art.10, comma 5, lettera c)	30	2	1-2
MASTER THESIS (30 ECTS)	Master Thesis (24 ECTS) + Internship (6 ECTS)				

		TYPE	**ECTS**	**year**	**SEM**
ADDITIONAL COMMUNICATION SKILLS		ADDITIONAL TRAINING ACTIVITIES (art. 10, comma5, lettera d)	3	2	1-2
LABORATORY OF SCIENTIFIC ENGLISH (3 ECTS) (for Italian SUMA students) ITALIAN LANGUAGE LEVEL A2 (non-Italian SUMA students)	Project Management (3 ECTS)				

		TYPE	**ECTS**	**year**	**SEM**
INTERNSHIP		ADDITIONAL TRAINING ACTIVITIES (art. 10, comma5, lettera d)	3	2	1-2
INTERNSHIP (3 ECTS)	Engineering Economy (3 ECTS)				