ANNEX 3

DEGREE PROGRAM DIDACTIC REGULATIONS

CLASS LM-MATHEMATICAL ENGINEERING

School: SCUOLA POLITECNICA E DELLE SCIENZE DI BASE

Department: DIPARTIMENTO DI MATEMATICA E APPLICAZIONI R. CACCIOPPOLI

Regulations in force since the academic year 2025-2026

DOUBLE DEGREE – JOINT DEGREE

1. PREMISE

In this section, please provide a description of the Double Degree and/or Joint Degree, clearly explaining the scientific rationale for the Agreement and the period to be spent at the Partner University, including the specific number of semesters. Indicate the access modality to the program (e.g., public selection) and specify the annual application deadline.

This Double Degree regards the following diplomas:
• the Master's Degree of the University of Augsburg "Mathematical Analysis and Modelling",
• the Master's Degree of the University of Napoli Federico II "Mathematical Engineering",
• the Master's Degree of the University of Napoli Federico II "Mathematics",
• the Master's Diploma of the University of Rouen "Mathématiques et applications", parcours "Mathematical Analysis and Modelling" (MAM),
• the Master's Diploma of the University of Sevilla "Máster Universitario en Matemáticas" (Universitary Master in Mathematics),
• the Master's Diploma of the Tomsk State University "Mathematics", program "Mathematical Analysis and Modelling" (MAM).

The Agreement concerns the students of one of the partner universities enrolled in one the Master's programs listed above, who will follow the corresponding Master's program at one of the other universities. The students, who will pass the examinations, will be awarded two Master's diplomas, one at the home university and the other at the host university.

During the first year of the Master's program, students will study at their home university.
Students will carry on their studies according to the following schedule: the third or the third and fourth semesters will be studied at the host university.
The learning program at the host university during the mobility must be approved by the Steering Committee members of both home and host universities, and take into account the wishes of the student.
The language of instruction will be English as soon as necessary. It may be the local language if it is

commonly understood by all students.
The partner universities undertake to inform and support the first-year Master, Bachelor and Engineering students about the conditions of the Double Degree Agreement in an appropriate way.

2. NUMBER OF STUDENTS

In this section, indicate the number of students who can be able to join the program annually.
There are no restriction on the number of students who can be able to join the program annually.

3. REQUIREMENTS FOR ACCESS TO THE DD PROGRAM

In this section, list the requirements for access to the DD program, including the year of enrolment, the minimum number of CFU (university training credit), and linguistic knowledge certification.

Students must comply with the training and examination procedures existing at the home and host university.
The following rules apply:
- A student should have obtained a minimum of 45 ECTS at the home university to be accepted at the host university.
- In order to obtain a double diploma, a student must obtain 120 ECTS, with a minimum of 60 ECTS obtained at the home university, and a minimum of 15 ECTS obtained at the host university (in addition to 30 ECTS of the master thesis).
For the Master's thesis within the Double Master's Degree Programme, each student has two supervisors, one from the home university and the other one from the host university. The Master's thesis is written and is defended in English.
The Master's thesis defence takes place at the home or host university, after positive reports of two referees, one from the home and the other from the host university. The thesis defence is held according to the rules of the partner university where it takes place. The supervisor and, if requested, other members of the other university are invited to attend the defence, possibly by videoconference.

4. SELECTION CRITERIA

In this section, list the criteria, as agreed upon with the Partner University, that will be used to select candidates (e.g., degree grade, weighted average of exam scores, number of exams taken, etc.). Additionally, specify any additional requirements such as a portfolio, motivation letter, etc. Finally, indicate the selection criterion in the event of a tie.
A student who intend to join the Double Degree program should have obtained a minimum of 45 ECTS at the home university to be accepted at the host university.

5. FINANCIAL SUPPORT

In this section, the financial aspects should be specified. In particular, the method of financial support provided should be indicated (e.g., Erasmus grant).
Students who intend to join the Double Degree program can apply for Erasmus grant.

6. EQUIVALENCES TABLES

The determination of "equivalences" between the educational activities outlined in the Degree Program Didactic Regulations and those at the Partner University must meet two criteria: one formal and another substantial. Firstly, the DD/JD program must align with the "detail sheet of the degree program". Secondly, all educational objectives specified in the "detail sheet of the degree program" must be fulfilled (as per framework A4.a of the Annual single form of the Degree Program - SUA). These criteria can be addressed through an "individual" study plan specifically tailored for students pursuing the double degree (DD) or joint degree (JD). Therefore, it is necessary to define a table for each Partner University that documents the equivalences between the exams outlined in the Study Plan of the degree program and those at the Partner University/ies, based on these principles.
For constructing the table effectively, it is suggested to work on pathways that can be considered equivalent not individually but referring to the entirety of contents (knowledge and skills, including applied ones) conveyed by the courses within each Learning Area as compiled in Framework A4.b.2 of the SUA-CdS.
Please, refer to the examples of tables provided below (the first is suitable for study programs more closely related in terms of the distribution of disciplinary contents among courses; the second is suitable for study programs that have greater difficulty in identifying detailed correspondences between a UniNA course and a course at the Partner University) and the subsequent clarification regarding the Learning Areas of Framework A4.b.2 and their correct compilation:

Table: University of Augsburg, Germany

UNINA TEACHINGS		ECTS	Teachings at the Partner University		ECTS
Engineering disciplines	Computational Fluid Dynamics	9	Engineering disciplines	Software project	6
	Electrodynamics of continuous media	9		Control theory	9
	Optional*	6		Mathematical Modelling	9
Mathematical disciplines	Autonomously chosen topics	6	Mathematical disciplines	Advanced Seminar on Analysis	6
TOTAL ECTS		**n. 30**	**TOTAL ECTS**		**n. 30**

Table: University of Rouen, France

UNINA TEACHINGS		ECTS	Teachings at the Partner University		ECTS
Engineering disciplines	Computational Fluid Dynamics	9	Engineering disciplines	Basic Course of Asymptotic Statistic	6
	Electrodynamics of continuous media	9		Control and Optimization A	6
				Control and Optimization B	6
	Optional*	6		Scientific Calculus A	6
Mathematical disciplines	Autonomously chosen topics	6	Mathematical disciplines	Analysis of Partial Differential Equations A	6
TOTAL ECTS		**n. 30**	**TOTAL ECTS**		**n. 30**

Table: University of Seville, Spain

UNINA TEACHINGS		ECTS	Teachings at the Partner University		ECTS
Engineering disciplines	Computational Fluid Dynamics	9	Engineering disciplines	Statistical Data Mining	6
	Electrodynamics of continuous media	9		Optimization	6
	Optional*	6		Dynamical Systems	6
				Statistical Modeling and Prediction	6
Mathematical disciplines	Autonomously chosen topics	6	Mathematical disciplines	Functional Analysis	6
TOTAL ECTS		n. 30	TOTAL ECTS		n. 30

Table: Tomsk State University, Russia

UNINA TEACHINGS		ECTS	Teachings at the Partner University		ECTS
Engineering disciplines	Computational Fluid Dynamics	9	Engineering disciplines	Modern Methods of Data Mining	3
	Electrodynamics of continuous media	9		Statistical Analysis and Forecasting of Time Series	3
	Optional*	6		Multivariate Statistical Methods	3
				Methods of Spline Functions	3
				Industrial Mathematics	3
				Research	9
Mathematical disciplines	Autonomously chosen topics	6	Mathematical disciplines	Methods of Solving Ill-Posed Problems	6
TOTAL ECTS		n. 30	TOTAL ECTS		n. 30

Optional* Choice curriculum A - UNINA

COURSE	CFU	LEARNING AREA
Optoelectronics	6	Engineering disciplines
Electromagnetic Fields	6	Engineering disciplines
Information Theory	6	Engineering disciplines
Systems Identification and Control	6	Engineering disciplines
Waves	6	Engineering disciplines

Optional* Choice curriculum B - UNINA

Mechanical Vibrations	6	Engineering disciplines
Electromagnetic Fields	6	Engineering disciplines
Heat Transfer	6	Engineering disciplines
Analysis and Control of Complex Systems	6	Engineering disciplines
Nonlinear Dynamics and Control	9	Engineering disciplines
Environment Fluid Mechanics and Hydraulics	6	Engineering disciplines
Theory of Elasticity	6	Engineering disciplines

MATHEMATICAL DISCIPLINES (Framework A4.b.2 of the SUA-CdS)

Knowledge and understanding:

With reference to the field of mathematical disciplines, the student will acquire advanced mathematical methods such as:
- techniques for deducing mathematical models;
- analytical and numerical solution techniques for partial differential equations;
- numerical methods to solve problems inherent to the dynamics of gases, fluids and solids;
- theoretical and practical knowledge relating to the analysis of stochastic processes;
- optimization techniques.

Ability to Apply Knowledge and Understanding:

Appropriate activities will be planned as part of the courses, in particular during exercises and laboratory activities application of the knowledge acquired, through the analysis and study of model cases. The ability to selection of the mathematical model to use, appropriately measuring the desired accuracy and complexity tolerated, seeking a satisfactory adherence to reality but with careful consideration of costs. The verification the acquisition of contents, skills and scientific competences by students will, as a rule, be entrusted to the final exam of the courses. An important phase of maturation and evaluation of awareness critical in the use of scientific instruments will be the final test, in which students will apply the knowledge acquired in the plurality of attended courses to the same object of study.

Educational Activities through which knowledge and understanding capabilities are achieved and assessed:

ADVANCED APPLIED ENGINEERING MATHEMATICS
ALGEBRAIC STRUCTURES AND ADVANCED LINEAR ALGEBRA
ALGORITHMS AND PARALLEL COMPUTING
DIFFERENTIAL GEOMETRY
DISCRETE MATHEMATICS
GEOMETRIC STRUCTURES AND TOPOLOGY
MATHEMATICAL METHODS FOR ENGINEERING
MATHEMATICAL PHYSICS MODELS
MATHEMATICS FOR CRYPTOGRAPHY
MECHANICAL VIBRATIONS
MODERN AND SOLID STATE PHYSICS
NUMERICAL METHODS
OPERATIONAL RESEARCH
PARTIAL DIFFERENTIAL EQUATIONS
REAL AND FUNCTIONAL ANALYSIS
SOLID STATE PHYSICS *(modulo di MODERN AND SOLID STATE PHYSICS)*
STOCHASTIC PROCESSES

ENGINEERING DISCIPLINES (Framework A4.b.2 of the SUA-CdS)

Knowledge and understanding

Engineering knowledge will allow:
- the deepening of advanced knowledge regarding the mechanics of continuous media (in particular fluids), especially from the point of view of the specific numerical modeling simulation of their dynamic behaviour;
- the acquisition of knowledge of electrodynamics and electromagnetism, their modeling and simulation numerical in advanced applications;
- the in-depth study of the mechanisms at the nano- and mesoscopic scale that govern the behavior of matter and to chemical and physical transformations, and their modeling;
- the in-depth study of the dynamic behavior of free non-linear systems of engineering interest or in their interaction with control logics.

Ability to Apply Knowledge and Understanding:

The problem-solving attitude typical of an engineering education will be developed through examples of application of the methodologies taught to model cases and real cases. The teaching activities will be structured accordingly significant planning moments must be foreseen. As in the case of mathematical disciplines, the verification the acquisition of contents, skills and competences by students will be entrusted to the final exam courses, which involves the execution of practical exercises and often the evaluation of the projects developed as part of the course. In addition to attending institutional courses, an important opportunity to acquire critical awareness in the use of the scientific and technical tools used will be the preparation of the final thesis, during which the student will have to demonstrate not only the ability to develop an original paper of a relevant theoretical, experimental or planning nature to mathematics, industrial, information or civil engineering, but also to have acquired the ability to operate in autonomous way, mastery of the theoretical and technical tools used, which must be managed and analysed critically for the purpose of processing the data obtained.

Educational Activities through which knowledge and understanding capabilities are achieved and assessed:

ALGORITHMS AND PARALLEL COMPUTING
ANALYSIS AND CONTROL OF COMPLEX SYSTEMS
CHEMICAL PROCESS ANALYSIS AND SIMULATION *(modulo di STATISTICAL METHODS AND CHEMICAL PROCESS)*
COMPUTATIONAL FLUID DYNAMICS
ELECTROMAGNETIC FIELDS
ENVIRONMENT FLUID DYNAMICS AND HYDRAULICS
Electrodynamics of continuous media
HEAT TRANSFER
INFORMATION THEORY
MECHANICAL VIBRATIONS
NONLINEAR DYNAMICS AND CONTROL
NONLINEAR SYSTEMS
OPTOELECTRONICS
SIGNAL THEORY *(modulo di STAISTICAL METHODS AND SIGNAL THEORY)*
STAISTICAL METHODS AND SIGNAL THEORY
STATISTICAL METHODS AND CHEMICAL PROCESS
SYSTEMS IDENTIFICATION
TERMODYNAMICS AND TRANSPORT PHENOMENA
THEORY OF ELASTICITY
WAVES

The Degree program (CdS) identifies its **Learning Areas**, they are autonomously defined according to the first two Dublin Descriptors: "Knowledge and understanding" (knowing) and "Ability to apply

knowledge and understanding" (knowing how to do), referring to discipline-specific knowledge and skills acquired in specific fields and by-passing specific exams. The Learning Areas are chosen by the CdS in line with the educational project.

For each identified Area, it is necessary to list the educational activities (courses) activated in the reference academic year, which contribute to achieve the expected learning outcomes. The list of courses must be provided **annually**, considering that some courses may be newly activated, deactivated, offered every other year, or undergo changes in their denomination, among other possibilities.

Specifically, for each Learning Area, each Course has to specify:

Knowledge and Understanding:
i.e. expected learning outcomes with respect to disciplinary knowledge/competence and understanding (Dublin Descriptor 1), associated with the considered Learning Area.
Ability to Apply Knowledge and Understanding:
expected learning outcomes related to the ability to apply disciplinary knowledge/competence and understanding (Dublin Descriptor 2), associated with the considered Learning Area.
Educational Activities through which knowledge and understanding capabilities are achieved and assessed:
these activities include educational activities (i.e., courses) that contribute to achieve and assess the disciplinary knowledge/competence and understanding of the considered Learning Area. Each specific educational objective (Framework **A4.a**) should be reflected in the educational activities (grouped in Learning Areas of Framework **A4.b2**[1]). It is advisable to include hyperlinks to the Course Detail that describes the different aspects of the course (e.g., learning goals, course content, readings, teaching methods, examination/evaluation criteria).

7. STUDY PLANS TABLES DD - JD

Attention: The Equivalences Table does not concern all courses of the degree program but mainly those that the UNINA student must complete at the Partner University.
Please see the example below.

[1] Framework A4.b.2 connects three levels of detail:

- The **highest level**: where the Dublin Descriptors of each Learning Area of Framework A4.b.2 represent the basis of the overall synthesis presented in Framework A4.b.1 (which in turn connects with what has already been outlined in Framework A4.a).

- **The intermediate level**: where clusters of courses are gathered in Learning Areas, connecting through common cultural horizons, scientific paradigms, methods, and techniques.

- **The lowest level**: the Course detail designed to declare the expected learning outcomes, the methods of knowledge and skill transmission, and the methods of assessing acquired results. The Course detail represents the additional level of detail where clusters of courses finally differentiate from each other.

The tables show the exams that the UNINA student (and the student of the Partner University) must give for each year, specifying the location where they will be attended.

UNINA Student's I Year Path
As in the regular study plan UNINA, 63 CFU

UNINA Student's II Year Path – Partner University

I semester: Università Partner	CFU	II semester: Università Federico II	CFU
Training activities Engineering disciplines	9	Training activities Engineering disciplines	9
Autonomously chosen topics related to the modelling-application or advanced theoretical area	6	Autonomously chosen topics Engineering disciplines Mathematical disciplines	12
		Other topics	3
		Final test	18

Partner University Student's I Year Path
As in the regular study plan of the partner University

Partner University Student's II Year Path

I semester: Università Federico II	CFU	II semester: Università Partner	CFU
Training activities	9	As in the regular study plan of the partner University	24
Autonomously chosen topics related to the modelling-application or advanced theoretical area	6	Final test	18

Final test

For the Master's thesis in the Double Master's Degree programme, each student has two supervisors, one from the home University and the other from the host University. The Master's thesis is written and discussed in English. The defence of the Master's thesis takes place at the home or host University, after positive reports from the two reviewers, one from the home University and the other from the host University. The defence of the thesis is conducted according the rules of the partner University where it takes place. The supervisors and, if requiested, other members of the other University are invited to attend the discussion, possibly via videoconference.