



UNIVERSITÀ
DEGLI STUDI
DI PALERMO



UNIVERSITY
OF TURKU

**DOUBLE MASTER DEGREE AGREEMENT
BETWEEN THE
UNIVERSITY OF PALERMO
AND THE UNIVERSITY OF TURKU**

concerning the

Master Degree in “Physics (LM-17)”

awarded by the University of Palermo

and the

Master Degree Programme (MDP) in Physical and Chemical Sciences: i) Theoretical Physics, ii) Astronomy and Space Physics, iii) Materials Physics

awarded by the University of Turku

On one part, University of Palermo, hereinafter also referred to as the “UNIPA”, with registered office at Piazza Marina n. 61, 90133 Palermo, Italy, VAT number 00605880822, and on its behalf and represented by prof. Massimo Midiri, Rector of the University of Palermo;

on the other part, the University of Turku, hereinafter also referred to as the “UTU”, with registered office at Yliopistonmäki 20100 TURUN YLIOPISTO, VAT number FI02458963, and on its behalf and represented by prof. Jukka Kola, Rector of the University of Turku (*hereafter called Parties*).

STATE

1. That both institutions share cultural, technical, educational, and scientific fields of common interest;
2. That collaboration and the exchange of experience and knowledge, as well as the provision of services between both institutions, are in their greatest interest for social and cultural progress;
3. That they are interested in promoting their international collaboration in the field of higher education and research;

THAT BEING SAID, THE PARTIES AGREE

to sign an agreement that specifies the conditions under which students may access and opt for a double Master degree in association with MSc degree, awarded by the University of Palermo, within “Laurea Magistrale in Fisica” (“Master degree in Physics” class LM-17) and in association with MSc degree (*filosofian maisteri in Finnish*), awarded by the University of Turku, within MDP in Physical and Chemical Sciences: i) Theoretical Physics, ii) Astronomy and Space Physics, iii) Materials Physics. The awarding of the Double Master Degree, conferred by the two Universities in accordance with the current regulations at each institution, is subject to compliance with the clauses established in this agreement.

Art. 1 – Purpose of the agreement

This agreement aims to establish the academic and administrative conditions under which students enrolled at the “Master degree in Physics” at UNIPA, and students enrolled at the master degree programme in “Physical and Chemical Sciences: Astronomy and Space Physics”, or in “Physical and Chemical Sciences: Materials Physics”, or in “Physical and Chemical Sciences: Theoretical Physics” at UTU, may access and opt for a double Master Degree conferred by both Universities, subject to compliance with the clauses established in this agreement, and in accordance with the current regulations at each institution in the current version of the time.

Both Universities consider that the two degree programmes are similar and equivalent and mutually recognize the educational activities of the respective study programmes, which are listed in Annex 1. The joint plan of educational activities offered for the double Master Degree is richer than the individual offer of each University. This benefit is achieved due to the complementary character of the educational plans of the two Universities.

This agreement defines (i) the formal aspects and operational principles of the joint programme (ii) the degrees related to this programme provided by the partner universities, (iii) student eligibility and student selection process, (iv) division of work and the responsibilities of each university, (v) commitments for providing resources for the programme, (vi) arrangements for quality control and assessment, (vii) constitution of management and the definition of the Steering Group tasks for the programme, (viii) disputes and arbitration, and (ix) terms of expiration and termination principles.

Art 2. - Double Degree Programme

The structure and the objectives of the degree follow the existing ones in each partner university. All procedural rules will be determined in accordance with the regulations at each institution. The eligibility for further academic studies provided by the Double degree programme follows the national legislation of Finland and Italy.

2.1. Curriculum: The programme consists of four principal study modules: (i) a mandatory course module in major subject of one of the participating programmes, (ii) an elective module including courses and a practical project in the major subject, (iii) a course module in a minor subject, and (iv) a Master’s thesis. In addition, there can be local language and culture studies designed for international students.

Courses are subject to progressive modification in order to follow up advances and developments in the subject areas concerned as well as to update according to arising industrial or societal needs. The

curriculum will be officially accepted in both universities according to local regulations and processes and is a subject of local quality assurance processes at both universities.

This Agreement is accompanied by a list of the courses and other curricular activities (Annex 1) that students enrolled in the double degree programmes may according to present curricula opt during their stay at the host university in order to obtain the double degree. In the Annex 1 there are the similarities and correspondences of the two degree programmes for a minimum of 30 ECTS (credits).

The curriculum of the table (Annex 1) must be approved in advance by the academic bodies of both Universities, and can be modified in each academic year, after approval of the academic bodies of both Universities.

2.2. Credits and Assessment: The double programme is 2-year full time study of 120 ECTS in total, and the master's thesis work is in minimum one semester long. Overseas students may take language and culture studies as part of their elective course module. All study points as well as grades earned by the students in the joint programme will be mutually acknowledged and accredited by the Parties. A credit and grade transfer system is based on ECTS for fluent and transparent conversion between the UTU and Palermo credit systems.

The examination and assessment of students of the Degree Programme, including assessment methods and criteria, grading, the conversion table for grades, access to information on grading, resists and re-assessments, functional disorders and handicaps, unfair practice and fraud are regulated by both universities according to common rules and in compliance with local regulations.

The course examination follows the conditions of the University where the course is carried out. University awards marks based on its own grading system according to common rules.

All courses are measured according to the ECTS system and in conformity to national regulations. Both Universities accept differences in national regulations among them concerning awarding ECTS credits and they recognise the number of ECTS credits awarded by other University for the degree programme without further conversion.

At the University of Turku courses are assessed using grading scale 0 – 5, in which 0 is Fail and 5 Excellent. Some of the courses are graded on PASS / FAIL scale only.

At the University of Palermo courses are assessed using grading scale 0 – 30. All grades below 18 mean fail. Some of the courses are graded on PASS/FAIL scale only.

The parties agree upon the following conversion table:

UTU grades	UTU grades description	UNIPA grades
0	Fail	<18
1	Sufficient	18-20
2	Satisfactory with many errors	21-23
3	Good with some errors	24-26
4	Very good with few errors	27-29
5	Excellent	30, 30 <i>cum laude</i>

2.3. Language of Instruction: All courses will be given in English, and English is used in project and thesis work. However, language courses can be given also in Italian or Finnish in order to support cultural integration.

2.4. Co-supervising Master Thesis: In addition to the courses from Annex 1 relevant for obtaining the double degree, in consultation with Coordinators at home institution, students need to perform the Master Thesis co-supervised by professors of both Universities. The co-supervised Master Thesis can be performed either at home or partner university.

Master's thesis is worth of 30 ECTS. At least one supervisor is nominated from the home university. At least one supervisor comes from the partner university who has most expertise on the subject or who is leading the research project the student is taking part in. Both parties will follow the rules and regulations of their own university in nominating the evaluators and in thesis assessment.

In addition to the 30 ECTS Master's thesis UNIPA curriculum includes a thesis defense worth 7 ECTS (Esame di Laurea).

At UNIPA the successful candidate is awarded a Master Degree in Physics with grade ranging for 66 to 110 *cum laude* according to the “**Regolamento della prova finale di Laurea**”.

For students from UTU participating to the Double Degree program the Italian final grade is determined according to the “**Regolamento della prova finale di Laurea**”. The final grade will be determined from the Steering Committee by considering

- 1) The grade given to the Master's Thesis
- 2) The average of the grades obtained in student's courses. appearing in the student's study plan.
- 3) The thesis defence if taken also in Palermo.

At UTU the thesis evaluation is based on the joint evaluation categories and grade descriptions. At the UTU the Master's thesis is graded on the following scale: fail (0), sufficient (1), satisfactory (2), good (3), very good (4), excellent (5).

At the UNIPA Master's thesis defence is assessed using the grading scale 0 – 11.

UTU is using an electronic thesis process called UTUGradu, which merges the processes related to master's thesis including an electronic thesis submission, originality check (plagiarism detection), examination and approval process, electronic publication, and electronic archiving. At UNIPA the thesis tutor (Relatore di Tesi) makes checks for the detection of possible plagiarisms.

At the UTU a Master's thesis must be graded within 4 weeks after the submission to the UTUGradu system. During the summer (June to August) and in special circumstances, grading may take longer. At the University of Palermo Thesis defence is held in three different dedicated sessions during the academic year, usually held in March/April, June/July and October. Each candidate can choose the period nearest to the epoch of thesis submission.

2.5. Student application and admission: The maximum number of students which could be enrolled in each double degree programme is 4 (four) for each academic year, from each University. The Parties will jointly select and approve the admission of students according to the entrance requirements of Palermo and UTU. Each university will announce yearly the application call for participating to double degree programme. The call is aimed for the students who are already enrolled within the MSc programmes mentioned in this Agreement in each partner university.

The student selection is based on the eligibility, study success, and if needed interviews of the students who have applied to the joint programme. The students shall have the proficiency of the English language. The student selection and its timing will follow the specific regulations relevant

to each Party. A solution shall be defined by the Steering Committee in case a discrepancy is identified between schedule and regulations of the two parties.

Before beginning to take the courses at the host university, students admitted to the double degree programme must possess the minimum level of knowledge of the English language B2, level certified by the home university.

The student's final admission requires approval by the Partner University and admission into its corresponding degree programme.

2.6. Study guidance: Study guidance at UTU is given by the teachers of the courses, by the MSc specific teacher tutors, by the thesis supervisors and by the Education Coordinator. In the beginning of studies, students will make with help of teachers a personal study plan for the degree studies. Courses that will be completed at the partner university will be included in the personal study plan.

At UTU, the learning outcomes of each MSc line, curriculum, and organizing of teaching is described in detail in the Study Guide of University of Turku.

Study guidance at the UNIPA is given by the teachers of the courses, by the thesis supervisors and by the Master's Course Coordinator. Each student is assigned to a specific tutor that is one of the teachers of the courses. In the beginning of studies, students will make a personal study plan for the degree studies with the help of their tutor. Courses that will be completed at the partner university will be included in the personal study plan.

At UNIPA, the learning outcomes of the MSc line, curriculum, and organizing of teaching is described in detail in the Study Plan of the Master's Degree Course in Physics (Piano di Studi del Corso di Laurea Magistrale in Fisica).

2.7. Degree awarding: For the Master's degree programme, the following principles will apply. Students fulfilling the local degree requirements will receive a degree certificate from their home university. In addition, Master of Science degree of UTU will be offered to students of Palermo who have fulfilled the requirements for the double degree; Master of Science degree of Palermo will be offered to students of UTU who have fulfilled the requirements for the double degree.

- For the students of Palermo, who have completed the programme with (i) at least 30 ECTS earned at UTU, which may include a practical project (ii) a jointly supervised Master's thesis written in English, which has been examined and accepted by UTU, (iii) whose other credits have been accredited by UTU, and (iv) who have fulfilled the degree requirements of UTU, a UTU Master of Science Degree Certificate will be issued.
- For students of UTU who have completed the programme with (i) at least one semester of coursework (worth approx. 30 ECTS) at Palermo which may include a practical project, (ii) a jointly supervised Master's thesis written in English, which has been examined and accepted by Palermo, (iii) whose other credits are accredited by Palermo, and (iv) who have fulfilled the degree requirements of Palermo, a Palermo Master of Science Degree Certificate will be issued.
- Hence, students who fulfil both UTU Master of Science Degree or Palermo Master of Science Degree requirements will obtain two degrees and two degree certificates, one from each university.

2.8. Degree Certificates: A degree certificate will be issued by two of the universities, in accordance with above. Both certificates bear the name of the universities, the type of degree, as

well as in Finland a reference to the Government Decree on University Degrees 794/2004 with subsequent amendments. In addition, each student receives transcripts of records from each of the universities concerning the individual courses taken, with the course results, as well as a Diploma Supplement, according to standards of the Bologna Process of the European Higher Education Area.

Art. 3 - Study requirements, study program

Each student admitted to the double degree programme must submit their plan of studies to the approval of both universities.

The students participating in the double master's programme must attend one semester at the partner institution. In case of completion of the Master thesis at the partner University, this period can be extended to two semesters.

The partner institution pledges to provide the student with the information relating to the host country, visas, required medical insurance, etc., before their arrival. The partner institution must provide students in the double degree programme with the same services that it generally provides its own students.

Each institution's academic calendar will be considered when organizing the stays. The academic official responsible for this agreement must inform the incoming students about the organisation of the courses they must take during their stay at the partner institution.

All students admitted to double degree programme must register and present the transcript of records of the courses already taken at their home university, as well as the learning agreement with the courses they will take during their stay at the host institution.

After completing the stay, the host university must submit to the other partner institution the official student transcript of records issued by the partner institution in order to for the student to receive credit for the courses taken through the automatic credit transfer. The transcript of records must be presented in English and the home university is responsible for updating its records.

Art. 4 – Enrolment and tuition fees

The students follow the national regulations and local policies regarding tuition fees. As these regulations and policies change, the parties will change their policies accordingly.

Once the student has been accepted into the double Master Degree programme, they must be enrolled in the corresponding Master program both at home and partner institution unless the student has a lawful reason to postpone the enrolment such as pregnancy or obligatory military service. The enrolment will be carried out through Institutions local procedure.

Art. 5 – Students' obligations and rights

During the exchange period, the students will be subject to the rules and regulations of the partner institution and to all the legal and social obligations of the Host University. Likewise, they will enjoy the same rights as students enrolled at the partner institution.

If a student does not comply with the terms of this agreement, including the length of the stay at the partner institution and its curriculum, that student will forfeit any right to receive the Master Degree

from the partner institution and will be excluded from the double Master Degree programme, although they may still be eligible to obtain the Master Degree at their home University.

Art. 6 – Expenses

The signature of this agreement does not mean any financial fulfilment to the parties. No other monetary, personnel or other resources can be demanded from the parties on the basis of this agreement. However, both Parties will be responsible for local operational costs regardless of the home universities of the students participating in the activities. The Parties can separately or jointly apply for external funding to cover the costs.

Transport costs, medical insurance, accommodations, upkeep, and any other expenses arising during the exchange period established in the double master's programme will be charged from the student. The student must acquire health insurance that guarantees access to health care in the host country. This insurance must cover medical and health care, death and disability caused by an accident, repatriation assistance for death by any cause, and reimbursement for medical expenses caused by an accident.

The partner institution, through the administrative responsible officer for this agreement, pledges to provide assistance in the search for suitable accommodations, although all stay expenses will be charged to the student. Likewise, the partner institution pledges to provide the student with information relating to the host country, visas, required medical insurance, etc., before their arrival. The partner institution must provide students in the double Master Degree programme with the same services that they generally provide their own students.

UNIPA and UTU will undertake all efforts for finding national and international resources to assure financial support to this programme.

Art. 7 – Governance and Management

7.1. Management Group: Both Parties will appoint a Programme Director to coordinate the double degree programme and an administrative officer responsible for this agreement and its academic issues.

The academic officers of both institutions charged with the coordination of this double Master Degree programme will meet by video conference, at least once in a year, to evaluate the effectiveness of the learning program and the results achieved by students, as well as the resources supplied by both universities. They could suggest the necessary modifications to improve the quality of the programme and propose them to the competent Boards of both Universities.

7.2. Joint Steering Group: A joint Steering group will be established by the Parties to attend to the double degree programme which is monitoring the activities of the double degree programme and also providing guidance for the program's purpose. The Steering group will consist of 6 members, 3 of each university: a member of teaching staff, a member of academic affairs/administration and a student representative from each university.

- a. The tasks of the Joint Steering Group will be as follows:
 - i. to supervise, assess, and develop the study programme,
 - ii. to reassess and develop the admission criteria,
 - iii. to revise the Agreement of Cooperation, and
 - iv. to finally approve the selection of the applicants for the double degree programme.

b. The Joint Steering Group will meet regularly via video-conferencing or face-to-face meetings. In case of changes to either university's study programme, the double degree programme as well as the partner university has to be considered.

8. - Quality Assurance

The Parties agree to utilize their best quality policies and quality assurance systems to the double programme and individual courses on their campuses. Because the long-term success of the double programme will depend on their perceived quality among stakeholders including the students, the parties agree to undertake additional efforts for quality enhancements as follows:

- Joint benchmarking and joint development of the quality assurance systems of both Parties. This will be the responsibility of the Management Group.
- Also students will be involved to the development cycle when appropriate.
- Work towards joint assessment criteria so that the students are assessed on a uniform and equal basis in courses on both campuses.
- Utilize the modern approach for curricula development for active learning and teaching based aligned teaching, where the links and correspondence between learning outcomes, syllabus, teaching and learning activities, and assessment methods are systematically established.
- Support CDIO (Conceive-Design-Implement-Operate) education framework and methodology in curricula implementation

Art. 9 - Duration of the agreement

This agreement will take effect from the time of its signing by the representatives of both Universities, and will be valid for a period of five years. Following this period, the agreement may be renewed by written consent. Either one of the signatory institutions may terminate this agreement in writing, which must be sent to the partner institution six (6) months in advance. If one institution wishes to terminate this agreement, both pledge to meet their commitments to the students admitted into the double Master Degree programme before either one withdraws from it. Notwithstanding the cancellation of this agreement any student who has been commenced a course of study at the receiving institution prior to cancellation may complete the course of study with the above described degree and certificate arrangements.

Art. 10 – Academic and research exchanges

With the aim of supporting the double Master Degree programme, UNIPA and UTU will promote and coordinate by mutual consent the exchange of visiting professors and researchers as well as the organisation of workshop, seminars, conferences and publications on topics of common interest. The exchange and the development of the activities above mentioned will conform to the norms and procedures in force in the two Universities.

Art. 11 - Use of Logo

The Partners mutually commit not to use the name and/or logo or any other identifying marks of the other University for purposes other than those covered by the agreement, except for specific

agreements between the parties that provide, prior explicit approval, forms of communication and divulging of the initiatives covered by the agreement.

Art. 12 - Personal data treatment

Both Parties agree and undertake (and shall procure that those of its servants, employees, agents or sub-contractors involved in the execution of this Agreement) to comply with any requirements under data protection legislation and regulations in the country in which the Party is based and with Party's data protection policies as well as the Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and repealing Directive 95/46/EC (General Data Protection Regulation) OJ L 119/1, 4.5.2016.

Notwithstanding the general obligation in in this Article 12 where either Party is processing personal data, it shall ensure that it has in place appropriate technical and organisational measures to ensure the security of the personal data (and to guard against unauthorised or unlawful processing of the personal data and against accidental loss or destruction of, or damage to, the personal data). Personal data shall only be used by the Party for the purpose of administering the execution of this Agreement and shall not be disclosed to any third party that is not directly involved in the pursuit of this purpose. It shall be retained for the minimum period required after the termination of this Agreement, after which it will be securely deleted or destroyed.

The Party shall indemnify the other against all liabilities, costs, expenses, damages and losses (including but not limited to any direct, indirect or consequential losses, loss of profit, loss of reputation and all interest, penalties and legal costs (calculated on a full indemnity basis) and all other reasonable professional costs and expenses) suffered or incurred by the indemnified party arising out of or in connection with the breach of the obligations set out in this Article 12 by the indemnifying Party, its employees or agents, provided that the indemnified party gives to the indemnifier prompt notice of such claim, full information about the circumstances giving rise to it, reasonable assistance in dealing with the claim and sole authority to manage, defend and/or settle it. The liability of the indemnifying party under this clause shall be limited to two hundred thousand Euros (€200,000).

13. - Liability of the parties

The Parties shall not be liable for indirect or consequential damages or losses caused in the execution of this Agreement towards the other Party, with the exception of damages arising from the breach of the confidentiality obligations or the obligations set forth in the Article 12 of this Agreement. The aggregate liability of a Party under the Agreement shall be limited to 20.000 euros. Limitation of liability shall not apply to damages caused wilfully or due to gross negligence. A Party shall be independently liable towards third parties for damage it has caused.

A Party shall not be liable towards another Party for damage or delay caused by force majeure, i.e. an event that prevents or makes it unreasonably difficult to perform obligations in time. These include, but are not limited to, war, riot, natural disaster, discontinuity in the supply of power, fire, material restriction on a Party's operations required by the state budget or government, strike, embargo or other equally significant and unordinary reason beyond a Party's control. A failure or delay in fulfilling the obligations of this Agreement shall not continue longer than the reason for such failure or delay.

14. - Disputes and applicable law

The Parties agree that disputes will be brought to the court of the defendant if not solved through friendly negotiation.

Based on the spirit of mutual trust and friendly cooperation, both Parties agree that issues that have not been thought out or foreseen in this Agreement will be approached through friendly discussion and negotiation, aiming at avoiding insolvable disputes. Disputes concerning this agreement shall primarily be resolved in negotiations between the parties.

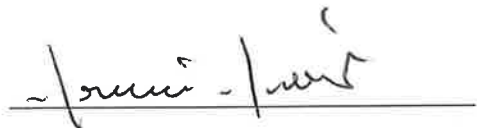
If any disagreement regarding the interpretation and application of the agreement arises in Finland, Finnish laws and regulations will be applied. If the disagreement arises in Italy, the laws and regulations of Italy will apply.

Art. 15- Final Clauses

The agreement is drawn up in 2 (two) copies in English, each of these texts being equally authentic. Both parties will receive one copy. All misinterpretations will be settled by mutual assent.

ON BEHALF OF UNIVERSITY OF
PALERMO

ON BEHALF OF THE UNIVERSITY OF
TURKU



Prof. Massimo Midiri

Rector of the University of Palermo



Prof. Jukka Kola

Rector of the University of Turku



Date: Palermo, 20/12/2021

Date: 3.3.2022



Prof. Tapio Salakoski

Dean of the Faculty of Science



Date: 22.2.2022

ANNEXES

Annex 1.1-1.6. List of courses and other curricular activities that students enrolled in the double degree programme between the “Master degree in Physics” at UNIPA and the Master degree in “Physical and Chemical Sciences: Astronomy and Space Physics” at UTU can select to obtain at least the equivalent of 30 ECTS during the stay at host university

Annex 1.1 List of courses and other curricular activities that students enrolled in the double degree programme between the “Master degree in Physics” at UNIPA and the Master degree in “Physical and Chemical Sciences: Astronomy and Space Physics” at UTU can select to obtain at least the equivalent of 30 ECTS during the stay at host university

<p style="text-align: center;">UNIPA</p> <p style="text-align: center;">Laurea Magistrale in Fisica</p> <p>Academic Year 2022-2023 (cohort 2021-2022) Academic Year 2024-2025 (cohort 2023-2024) Academic Year 2026-2027 (cohort 2025-2026)</p>	<p style="text-align: center;">UTU</p> <p style="text-align: center;">Master degree in “Physical and Chemical Sciences: Astronomy and Space Physics”</p> <p>Academic Year 2022-2023 (cohort 2021-2022) Academic Year 2024-2025 (cohort 2023-2024) Academic Year 2026-2027 (cohort 2025-2026)</p>
<p style="text-align: center;">Thematic Courses</p> <p>22019 - THEORY OF GENERAL RELATIVITY (1 Semester - 6 ECTS)</p> <p>22020 - HIGH ENERGIES ASTROPHYSICS WITH LABORATORY (1 Semester - 6 ECTS)</p>	<p>Cosmology I (1 semester – 4 ECTS)</p> <p>Cosmology II (1 semester – 4 ECTS)</p> <p>Spectroscopic diagnostic in astrophysics (1 semester – 8 ECTS)</p> <p>Stellar structure and evolution (1 semester – 8 ECTS)</p>
<p style="text-align: center;">Elective Courses</p> <p>21961 - ASTROPHYSICS - LABORATORY (1 Semester - 6 ECTS)</p> <p>21963 - PHYSICS OF COMPLEX SYSTEMS (1 Semester - 6 ECTS)</p> <p>21960 - QUANTUM THERMODYNAMICS (1 Semester - 6 ECTS)</p> <p>21958 - COMPLEX NETWORKS (1 Semester - 6 ECTS)</p> <p>21957 - GAUGE THEORIES AND STANDARD MODEL (1 Semester - 6 ECTS)</p> <p>21951 - APPLIED PHYSICS TECHNIQUES AND EQUIPMENT (1 Semester - 6 ECTS)</p> <p>21956 - STELLAR EVOLUTION (1 Semester - 6 ECTS)</p>	<p>Observational techniques using the Nordic Optical telescope (1 semester – 7 ECTS)</p> <p>High energy astrophysics (1 semester – 8 ECTS)</p> <p>Space physics (1 semester – 5 ECTS)</p> <p>Observational astronomy (1 semester – 5 ECTS)</p> <p>Data analysis and knowledge discovery (1 semester – 5 ECTS)</p>

Annex 1.2 List of courses and other curricular activities that students enrolled in the double degree programme between the “Master degree in Physics” at UNIPA and the Master degree in “Physical and Chemical Sciences: Astronomy and Space Physics” at UTU can select to obtain at least the equivalent of 30 ECTS during the stay at host university

<p style="text-align: center;">UNIPA</p> <p style="text-align: center;">Laurea Magistrale in Fisica</p> <p>Academic Year 2023-2024 (cohort 2022-2023) Academic Year 2025-2026 (cohort 2024-2025) Academic Year 2027-2028 (cohort 2026-2027)</p>	<p style="text-align: center;">UTU</p> <p style="text-align: center;">Master degree in “Physical and Chemical Sciences: Astronomy and Space Physics”</p> <p>Academic Year 2023-2024 (cohort 2022-2023) Academic Year 2025-2026 (cohort 2024-2025) Academic Year 2027-2028 (cohort 2026-2027)</p>
<p style="text-align: center;">Thematic Courses</p> <p>22019 - THEORY OF GENERAL RELATIVITY (1 Semester - 6 ECTS)</p> <p>22020 - HIGH ENERGIES ASTROPHYSICS WITH LABORATORY (1 Semester - 6 ECTS)</p>	<p>Plasma physics (1 semester – 5 ECTS)</p> <p>Plasma astrophysics (1 semester – 5 ECTS)</p> <p>Optics (1 semester – 5 ECTS)</p> <p>Observational techniques using the Nordic Optical telescope (1 semester – 7 ECTS)</p>
<p style="text-align: center;">Elective Courses</p> <p>21961 - ASTROPHYSICS - LABORATORY (1 Semester - 6 ECTS)</p> <p>21963 - PHYSICS OF COMPLEX SYSTEMS (1 Semester - 6 ECTS)</p> <p>21960 - QUANTUM THERMODYNAMICS (1 Semester - 6 ECTS)</p> <p>21958 - COMPLEX NETWORKS (1 Semester - 6 ECTS)</p> <p>21957 - GAUGE THEORIES AND STANDARD MODEL (1 Semester - 6 ECTS)</p> <p>21951 - APPLIED PHYSICS TECHNIQUES AND EQUIPMENT (1 Semester - 6 ECTS)</p> <p>21956 - STELLAR EVOLUTION (1 Semester - 6 ECTS)</p>	<p>Formation and evolution of planetary systems (1 semester – 5 ECTS)</p> <p>Galaxies and cosmology (1 semester – 8 ECTS)</p> <p>Observational astronomy (1 semester – 5 ECTS)</p> <p>Space physics (1 semester – 5 ECTS)</p> <p>Radiation and particle detectors (1 semester – 5 ECTS)</p> <p>Data analysis and knowledge discovery (1 semester – 5 ECTS)</p>

Annex 1.3 List of courses and other curricular activities that students enrolled in the double degree programme between the “Master degree in Physics” at UNIPA and the Master degree in “Physical and Chemical Sciences: Materials Physics” at UTU can select to obtain at least the equivalent of 30 ECTS during the stay at host university

<p style="text-align: center;">UNIPA</p> <p style="text-align: center;">Laurea Magistrale in Fisica</p> <p>Academic Year 2022-2023 (cohort 2021-2022) Academic Year 2024-2025 (cohort 2023-2024) Academic Year 2026-2027 (cohort 2025-2026)</p>	<p style="text-align: center;">UTU</p> <p style="text-align: center;">Master degree in “Physical and Chemical Sciences: Materials Physics”</p> <p>Academic Year 2022-2023 (cohort 2021-2022) Academic Year 2024-2025 (cohort 2023-2024) Academic Year 2026-2027 (cohort 2025-2026)</p>
<p style="text-align: center;">Thematic Courses</p> <p>22018 – COMPUTATIONAL PHYSICS WITH LABORATORY (1 Semester – 6 ECTS)</p> <p>22021 - STRUCTURE OF MATTER - ADVANCED COURSE (1 Semester - 6 ECTS)</p> <p>22022 - BIOPHYSICS (1 Semester - 6 ECTS)</p>	<p>Structural and thermal properties of solids (1 semester – 5 ECTS)</p> <p>Magnetism and spintronics (1 semester – 5 ECTS)</p> <p>Molecular electron structure theory (1 semester – 5 ECTS)</p>
<p style="text-align: center;">Elective Courses</p> <p>21960 - QUANTUM THERMODYNAMICS (1 Semester - 6 ECTS)</p> <p>21951 - APPLIED PHYSICS TECHNIQUES AND EQUIPMENT (1 Semester - 6 ECTS)</p> <p>21962 - NANO-PARTICLES AND NANO-STRUCTURES (1 Semester - 6 ECTS)</p> <p>21959 - BIOSYSTEMS PHYSICS WITH LABORATORY (1 Semester - 6 ECTS)</p>	<p>Physics of nanostructures (1 semester – 5 ECTS)</p> <p>Molecular symmetry and spectroscopy (1 semester – 5 ECTS)</p> <p>Acquisition and analysis of biosignals (1 semester – 5 ECTS)</p> <p>Data analysis and knowledge discovery (1 semester – 5 ECTS)</p>

Annex 1.4 List of courses and other curricular activities that students enrolled in the double degree programme between the “Master degree in Physics” at UNIPA and the Master degree in “Physical and Chemical Sciences: Materials Physics” at UTU can select to obtain at least the equivalent of 30 ECTS during the stay at host university

<p style="text-align: center;">UNIPA</p> <p style="text-align: center;">Laurea Magistrale in Fisica</p> <p>Academic Year 2023-2024 (cohort 2022-2023) Academic Year 2025-2026 (cohort 2024-2025) Academic Year 2027-2028 (cohort 2026-2027)</p>	<p style="text-align: center;">UTU</p> <p style="text-align: center;">Master degree in “Physical and Chemical Sciences: Materials Physics”</p> <p>Academic Year 2023-2024 (cohort 2022-2023) Academic Year 2025-2026 (cohort 2024-2025) Academic Year 2027-2028 (cohort 2026-2027)</p>
<p style="text-align: center;">Thematic Courses</p> <p>22018 – COMPUTATIONAL PHYSICS WITH LABORATORY (1 Semester – 6 ECTS)</p> <p>22021 - STRUCTURE OF MATTER - ADVANCED COURSE (1 Semester - 6 ECTS)</p> <p>22022 - BIOPHYSICS (1 Semester - 6 ECTS)</p>	<p>Electrical properties of solids (1 semester – 5 ECTS)</p> <p>Electrical transport in solids and interfaces (1 semester – 5 ECTS)</p> <p>Semiconductors (1 semester – 5 ECTS)</p>
<p style="text-align: center;">Elective Courses</p> <p>21960 - QUANTUM THERMODYNAMICS (1 Semester - 6 ECTS)</p> <p>21951 - APPLIED PHYSICS TECHNIQUES AND EQUIPMENT (1 Semester - 6 ECTS)</p> <p>21962 - NANO-PARTICLES AND NANO-STRUCTURES (1 Semester - 6 ECTS)</p> <p>21959 - BIOSYSTEMS PHYSICS WITH LABORATORY (1 Semester - 6 ECTS)</p>	<p>Electron and ion spectroscopy (1 semester – 5 ECTS)</p> <p>Measurement methods in physics (1 semester – 5 ECTS)</p> <p>Optical systems applications (1 semester – 5 ECTS)</p> <p>Biomaterial science (1 semester – 5 ECTS)</p> <p>Acquisition and analysis of biosignals (1 semester – 5 ECTS)</p> <p>Data analysis and knowledge discovery (1 semester – 5 ECTS)</p>

Annex 1.5 List of courses and other curricular activities that students enrolled in the double degree programme between the “Master degree in Physics” at UNIPA and the Master degree in “Physical and Chemical Sciences: Theoretical Physics” at UTU can select to obtain at least the equivalent of 30 ECTS during the stay at host university. For this curriculum, a student of UNIPA participating in the double degree program must attend two semesters at UTU to complete courses granting a minimum of 30 ECTS

<p style="text-align: center;">UNIPA</p> <p style="text-align: center;">Laurea Magistrale in Fisica</p> <p>Academic Year 2022-2023 (cohort 2021-2022) Academic Year 2024-2025 (cohort 2023-2024) Academic Year 2026-2027 (cohort 2025-2026)</p>	<p style="text-align: center;">UTU</p> <p style="text-align: center;">Master degree in “Physical and Chemical Sciences: Theoretical Physics”</p> <p>Academic Year 2022-2023 (cohort 2021-2022) Academic Year 2024-2025 (cohort 2023-2024) Academic Year 2026-2027 (cohort 2025-2026)</p>
<p style="text-align: center;">Thematic Courses</p> <p>22021 - STRUCTURE OF MATTER - ADVANCED COURSE (1 Semester - 6 ECTS)</p> <p>22024 - QUANTUM OPTICS (1 Semester - 6 ECTS)</p>	<p>Statistical physics I (1 semester – 4 ECTS)</p> <p>Statistical physics II (1 semester – 4 ECTS)</p> <p>Cosmology I (1 semester – 4 ECTS)</p> <p>Cosmology II (1 semester – 4 ECTS)</p>
<p style="text-align: center;">Elective Courses</p> <p>21963 - PHYSICS OF COMPLEX SYSTEMS (1 Semester - 6 ECTS)</p> <p>21960 - QUANTUM THERMODYNAMICS (1 Semester - 6 ECTS)</p> <p>21958 - COMPLEX NETWORKS (1 Semester - 6 ECTS)</p> <p>21957 - GAUGE THEORIES AND STANDARD MODEL (1 Semester - 6 ECTS)</p> <p>21962 - NANO-PARTICLES AND NANO-STRUCTURES (1 Semester - 6 ECTS)</p> <p>21995 - COMPUTATIONAL ECONOPHYSICS (1 Semester - 6 ECTS)</p>	<p>Algorithm design (1 semester – 5 ECTS)</p> <p>Data analysis and knowledge discovery (1 semester – 5 ECTS)</p> <p>Quantum information (2 semester – 4 ECTS)</p> <p>Quantum optics (2 semester – 4 ECTS)</p> <p>Differential Geometry, advanced course (2 semester – 4 ECTS)</p> <p>Open quantum systems I (2 semester – 4 ECTS)</p> <p>Open quantum systems II (2 semester – 4 ECTS)</p>

Annex 1.6 List of courses and other curricular activities that students enrolled in the double degree programme between the “Master degree in Physics” at UNIPA and the Master degree in “Physical and Chemical Sciences: Theoretical Physics” at UTU can select to obtain at least the equivalent of 30 ECTS during the stay at host university. For this curriculum, a student of UNIPA participating in the double degree program must attend two semesters at UTU to complete courses granting a minimum of 30 ECTS

<p style="text-align: center;">UNIPA</p> <p style="text-align: center;">Laurea Magistrale in Fisica</p> <p>Academic Year 2023-2024 (cohort 2022-2023) Academic Year 2025-2026 (cohort 2024-2025) Academic Year 2027-2028 (cohort 2026-2027)</p>	<p style="text-align: center;">UTU</p> <p style="text-align: center;">Master degree in “Physical and Chemical Sciences: Theoretical Physics”</p> <p>Academic Year 2023-2024 (cohort 2022-2023) Academic Year 2025-2026 (cohort 2024-2025) Academic Year 2027-2028 (cohort 2026-2027)</p>
<p style="text-align: center;">Thematic Courses</p> <p>22021 - STRUCTURE OF MATTER - ADVANCED COURSE (1 Semester - 6 ECTS)</p> <p>22024 - QUANTUM OPTICS (1 Semester - 6 ECTS)</p>	<p>Quantum field theory I (1 semester – 4 ECTS)</p> <p>Quantum field theory II (1 semester – 4 ECTS)</p> <p>Electrical properties of solids (1 semester – 5 ECTS)</p>
<p style="text-align: center;">Elective Courses</p> <p>21963 - PHYSICS OF COMPLEX SYSTEMS (1 Semester - 6 ECTS)</p> <p>21960 - QUANTUM THERMODYNAMICS (1 Semester - 6 ECTS)</p> <p>21958 - COMPLEX NETWORKS (1 Semester - 6 ECTS)</p> <p>21957 - GAUGE THEORIES AND STANDARD MODEL (1 Semester - 6 ECTS)</p> <p>21962 - NANO-PARTICLES AND NANO-STRUCTURES (1 Semester - 6 ECTS)</p> <p>21995 - COMPUTATIONAL ECONOPHYSICS (1 Semester - 6 ECTS)</p>	<p>Electron transport in solids and interfaces (1 semester – 5 ECTS)</p> <p>Algorithm design (1 semester – 5 ECTS)</p> <p>Data analysis and knowledge discovery (1 semester – 5 ECTS)</p> <p>Hilbert space operators (2 semester – 4 ECTS)</p> <p>Network theory (2 semester – 8 ECTS)</p>

