



## Supplementary Agreement

This supplementary agreement (SA) is based upon the Cooperation Agreement and relative MoU between National Taipei University of Technology, Taiwan (TAIPEI TECH) and University of Pavia, Italy (UPV). This SA details the cooperation between TAIPEI TECH and UPV for a Double Degree Master Program (abbreviated DD). This program is based on UPV two-years Master’s degree in Electronic Engineering (Laurea Magistrale in Electronic Engineering) and TAIPEI TECH Master’s degree in Electro-Optical Engineering. Abiding by the pertinent laws and decrees of Taiwan, the pertinent rules and regulations of the Ministry of Education in Taiwan and TAIPEI TECH, and also in accordance with the policy and decrees laid down by Italian Government with the rules and by laws of UPV, TAIPEI TECH and UPV will collaboratively launch and run the DD master program following the terms below. Each hosting institution will provide on its site facilities in the campus, including but not limited to classrooms, equipment, administrative support, laboratories, professor research rooms, and tangible and intangible resources suitable for the execution of the program. Multi-media such as e-conference will be used in TAIPEI TECH and UPV in order to facilitate the cooperation activity.

### 1. Execution Model for the Double Degree Master Program (DD)

The DD program will join TAIPEI TECH and UPV curricula. In TAIPEI TECH Curriculum, students should take at least 32 credits for graduation in two years and perform internship/thesis work for a total period of at least one year. In UPV curriculum, students should attend first at least three semesters of courses for a total of 96 UPV CFU (equivalent to 48 TW credits). Therefore the DD will include three semesters of courses and one year of internship/thesis work. Specifically the curriculum is shown in the table here below. This curriculum is detailed in Appendix A, that will be updated as needed according to the procedure stated in Paragraph 11.

	<b>Year 1 Term 1</b>	<b>Year 1 Term 2</b>	<b>Year 2 Term 1</b>	<b>Year 2 Term 2</b>	<b>Year 3 Term 1 (if student needs it)</b>
<b>TAIPEI TECH students</b>	TAIPEI TECH courses	TAIPEI TECH courses	UPV courses	UPV courses and thesis in Italy or Taiwan	Internship/thesis in Italy or Taiwan
<b>UPV students</b>	UPV courses	UPV courses	TAIPEI TECH courses	TAIPEI TECH courses and thesis in Italy or Taiwan	Internship/thesis in Italy or Taiwan

### 2. Size of the Joint Class

Maximum number of DD students being exchanged (Taiwanese to Italy and Italian to Taiwan) is 30 people.



### **3. Recruitment**

Both parties recruit the students of DD. The candidates of program should be the master students on both sides. The students on each side will have to pass through an entrance examination, and an English language examination (or TOEFL IBT with score high than 57 for Taiwanese students and Italian students) for admission of candidates at both sides. In order to be eligible to apply for the D.D. Master Program, the candidates from Taipei Tech shall have completed at least 20 credits.

### **4. Exchange of Students**

The students can apply for performing the thesis work (or the industrial internship) either in Taiwan or Italy. Each party should provide the appropriate arrangements and assist students in finding a Company where they can be hosted for the thesis or the industrial internship.

### **5. Matriculation, Registration for Courses, and Grading**

The process of matriculation, registration, and grading for courses should conform to the academic policies of both institution. The host institution must provide an official transcript to the home institution upon successful completion of the semester.

### **6. Registration and Fee**

All students will register at both universities from their entrance to this program. All students in the program will pay tuition for their home university and may be charged of nominal fee for administration at the hosting side. Each party should make every effort to find scholarship for the students of the program.

### **7. Curriculum**

Depending on the educational requirements of each university and considering the specialties of respective curricula on each side, the two curricula of the program will contain the modules of both universities. UPV will recognize credits given by TAIPEI TECH and TAIPEI TECH will recognize credits given by UPV, taking account of a normalization factor. As 1 TAIPEI TECH credit is equivalent to 2.4 CFU (UPV) credits, the following round-off is applied: two 3-credit courses at TAIPEI TECH are equivalent to two courses of 9 and 6 CFU at UPV. Thesis at TAIPEI TECH gives 15 credits. Each "Engineering Seminars" corresponds to 3 credits. Shared courses will be given in English; final thesis and oral presentation must be accomplished in English.

As policy, TAIPEI TECH curriculum will focus on Electro-Optical Engineering, and UPV curriculum will focus on Electronic Engineering (Photonics Curriculum). The detailed double curricula are given in an Appendix and be jointly reviewed yearly.

### **8. Internship, Thesis and Defence**

One year internship / thesis work is required by this double master program. A



thesis form shall be submitted to seek approval from both side before the start of thesis work. A joint Jury (“Commissione”) composed of professors from both sides will be established (face to face or via video conference) at the end of each program to valid the studies and decide to deliver the degrees.

## **9. Degrees**

The qualified graduate from this program will receive two degrees. They are Master of Science in Electro-Optical Engineering from TAIPEI TECH and Master of Science in Electronic Engineering (“Laurea Magistrale in Electronic Engineering”) from UPV.

According to the regulations of the Ministry of Education of the Republic of China (Taiwan), the duration of the aforementioned Master's degree program shall be limited to four years. Abiding by the agreement signed on July 4th, 2005 between the Governments of Taiwan and Republic of Italy, academic titles are mutually recognized.

## **10. Exchange of Teachers**

The teaching staff members from each side are mainly responsible for the teaching work in each own side. The exchange of teachers to cover part of courses is encouraged and will be supported by both parties.

## **11. Agreement Management**

Each party will appoint, by a letter to the other party, a tenure professor in charge of classes related to the agreement. These professors are, respectively, professor Hai-Han Lu (TAIPEI TECH) and professor Giuseppe Martini (UPV). Each party has the duty to get the required allowance/license for the program from the corresponding university and government departments on each side. Both parties will agree on appropriate updates on the classes, always according to their respective laws, regulations and by laws.

## **12. Effect**

This agreement will take effect for the period of 5 years after it is signed and sealed by all concerned parties. However, it may be extended, subject to a mutual review by relevant parties at the end of the period.



*Supplementary agreement for a Double Master Degree by National Taipei University of  
Technology, Taiwan (TAIPEI TECH) and University of Pavia, Italy (UPV)*



Signed: \_\_\_\_\_  
Prof. Leehter Yao  
President  
National Taipei University of Technology  
Taipei  
Taiwan  
Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
Prof. Fabio Rugge  
Rector  
University of Pavia  
Pavia  
Italy  
Date: \_\_\_\_\_



## Supplementary Agreement – Appendix A

This Appendix details the curriculum defined by both parties for the aforementioned double master program. This program complies with the regulations of each party.

### 1. Requirements of UPV Master's Degree in Electronic Engineering ("Laurea Magistrale in Electronic Engineering")

The curriculum for UPV two-years master degree in Electronic Engineering ("Laurea Magistrale in Electronic Engineering") requires 120 total credits or CFU (defined as per the Bologna protocol)

- Courses size will be not less than 3 and no more than 18 CFU
- Should include courses totalling not less than 96 CFU.
- Thesis work is credited 24 CFU

The curriculum should include the following topics ("Settore Scientifico Disciplinare" - SSD) associated with the following Italian Credits (CFU):

- Core ("Caratterizzanti"): Information Technology Engineering, Electronics (ING-INF/01) and Electromagnetic Fields (ING-INF/02), at least 45 CFUs
- Related ("Affini"): Physics of Matter (FIS/03), Telecommunications (ING-INF/03), Mathematics-Calculus (MAT/05), between 18 and 42 CFUs and at least 18 CFUs
- Elective/ Free Choice (FC): 12 CFUs
- Other activities ("Altre attività"): between 1 and 6 CFUs and at least 1 CFU

Credits gained on TAIPEI TECH courses are accredited according to UPV rules.

### 2. Requirements of TAIPEI TECH master degree in Electro-Optical Engineering

The curriculum for TAIPEI TECH two-years master degree in Electro-Optical Engineering requires at least 32 credits for graduation.

- Professional Required: 16 credits (including 6 credits for master's thesis, 4 credits for seminar, 6 credits for the courses "Introduction to Optoelectronic Engineering (I)(II)")
- Professional electives: 16 credits
  - Students should take at least 2 courses from 2 different research fields among the 4 ones with the courses mark A~D.
  - 9 credits can be approved from cross-department elective courses which the major graduate program does not provide and the advisor professor consents to.



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### **3. Combined requirements of the Double Master Degree**

Combined requirements of the double master degree imply the following approach for, respectively, TAIPEI TECH and UPV students:

- TAIPEI TECH students wishing to pursue the UPV Master in Electronic Engineering, should attend courses for 96 CFU complying with the requirements by topics and number of examinations mentioned by Paragraph 1.
- UPV students, in order to obtain the TAIPEI TECH master degree in Electro-Optical Engineering, should attend courses for at least 32 TAIPEI TECH credits, and internship or thesis for at least 6 TAIPEI TECH credits, and finish the thesis complying with TAIPEI TECH regulations.

### **4. Curricula**

In order to comply with TAIPEI TECH rules, the curriculum for TAIPEI TECH students has different credits for the first two semesters. The credit gap is recovered afterwards.



## Pavia's curriculum for TAIPEI TECH students

### Year 1 Semester 1 (at TAIPEI TECH)

#	TAIPEI TECH Course	SSD	CFU value	Equivalence to Pavia
1	Introduction to Optoelectronic Engineering (I )	ING-INF/01	18	<i>the two courses on the left are considered equivalent to:</i> Optoelectronic Devices (9 CFU) Advanced Mathematical Methods (9 CFU)
2	Elective Courses (one MAT/05 and one ING-INF/01 from Table I)	MAT/05		
3	Experiments for Optoelectronic Engineering (I)	FIS/03	3	<i>the two courses on the left are considered equivalent to</i> Quantum Electronics (6 CFU)
4	Engineering Seminar (1/4)		3	

### Year 1 Semester 2 (at TAIPEI TECH)

	TAIPEI TECH Course	SSD	CFU value	Equivalence to Pavia
5	Introduction to Optoelectronic Engineering (II)	FIS/03	7.5	<i>the two courses on the left are considered equivalent to:</i> Semiconductor Device Physics (6 CFU) Microwaves (9 CFU)
6	Elective Course (one ING-INF/02 from Table I)	ING-INF/02	7.5	
7	Experiments for Optoelectronic Engineering (II)	FIS/03	3	<i>the two courses on the left are considered equivalent to:</i> Sicurezza laser (6 CFU)
8	Engineering Seminar (2/4)		3	



## Year 2 Semester 1 (at UPV)

	Pavia Course	SSD	CFU value	Equivalence to TAIPEI TECH	Credit
9	Electro-optical Instrumentation	ING-INF/01	6	Optoelectronic Methods in Precision Measurement	3
10	Industrial Laser Design	ING-INF/01	6	Laser Engineering	3
11	Antenna and Propagation	ING-INF/02	9	Diffraction Optical Elements and Applications	3
12	Elective Course from Table II		6	-	3
13	Elective Course from Table II		3	-	3

## Year 2 Semester 2 (at UPV)

	Pavia Course	SSD	CFU value	Equivalence to TAIPEI TECH	Credit
14	Optical Communications	ING-INF/01	9	Fiber-Optic Communication A	3
16	Nonlinear Optics	FIS/03	6	Modern Optics	3
17	Digital Communications	ING-INF/03	6	Flat-Panel Display C	3
18	Thesis / Internship	other	24	Thesis / Internship	6

Elective courses are listed in Table below. Constraints of TAIPEI TECH (2 courses from 2 different research fields among the 4 ones with the courses mark A~D), and total credits are satisfied

Total CFUs of UPV curriculum for TAIPEI TECH students: ING-INF/01- 02: 45, ING-INF/03-FIS/03-MAT/05: 39, free choice: 12, thesis: 24, total: 120





**Table I- Elective courses at TAIPEI TECH for TAIPEI TECH students**

**1st Semester**

Code	Course Name	Credits	SSD
6505004	Experiments for Optoelectronic Engineering (I)	1.0	FIS/03
6503007	Modern Optics	3.0	FIS/03
6505016	Introduction to Fourier Optics	3.0 <b>B</b>	FIS/03
6505034	Fiber-Optic Communication	3.0 <b>A</b>	ING-INF01
6505010	Opto-electronic Methods in Precision Measurement	3.0	ING-INF/01
6505031	Integrated Optics	3.0	FIS/03
6505045	Physics of Semiconductor Device	3.0	FIS/03
6505050	Design and Application of Optical Coating	3.0	ING-INF/02
6505054	Epitaxy Technology and Measurement	3.0	ING-INF/01
6505058	Electro-Optical Industry Trend Analysis	3.0	ING-IND/35
6505089	Lens Design	3.0	FIS/03
6505093	Electronics of Liquid Crystal Display	3.0	ING-INF/01
6505095	Introduction of Solar Cells Technology	3.0	ING-INF/01
6505097	Optical Properties of Semiconductors	3.0 <b>D</b>	ING-INF/01
6505114	Preliminary Flat-Panel Display	3.0	ING-INF/01
6505122	Nonlinear Fiber Optics and Application	3.0	FIS/03
6505124	Lighting Design with TracePro	3.0	MAT/05



**2<sup>nd</sup> Semester**

Code	Course Name	Credits	Course Name
6505005	Experiments for Optoelectronic Engineering (II)	1.0	FIS/03
6505038	Flat Panel Display	3.0 <b>C</b>	ING-INF/01
6505066	Introduction to Biomedical Optics	3.0	ING-INF/06
6505090	Semiconductor Materials and Devices	3.0	ING-INF/01
6503532	Colorimetry	3.0	ING-INF/02
6505024	Fabrication of Photoelectronic Materials and Device	3.0	ING-INF/01
6505028	Optical Communication	3.0 <b>A</b>	ING-INF/01
6505033	Applied Optics	3.0	FIS/03
6505039	Diffraction Optical Elements and Applications	3.0	ING-INF/02
6505040	Laser Engineering	3.0 <b>B</b>	ING-INF/01
6505044	Dense Wavelength Division Multiplexing	3.0	ING-INF/03
6505052	Optics of Liquid Crystal Displays	3.0 <b>C</b>	FIS/03
6505066	Introduction to Biomedical Optics	3.0	ING-INF/06
6505096	Obtainment and Application of Property of High-Tech Patent	3.0	ING-IND/35
6505116	Introduction of Ultrafast Optics	3.0	FIS/03
6505131	Dialux Lighting Design	3.0	MAT/05
6505132	Ultrafast Optics and Application	3.0	FIS/03
6505049	Properties and Fabrication Techniques of Semiconductor Thin Film	3.0 <b>D</b>	ING-INF/01

Students should take at least 2 courses from 2 different research fields among the 4 ones with the courses mark A~D.



**Table II - Elective Courses at UPV for TAIPEI TECH students**

Code	Course Name	SSD	CFU	Semester
502962	Internet e Multimedia	ING-INF/03	6 CFU	1
502993	Microsensori, Microsistemi Integrati e MEMS (I)	ING-INF/01	6 CFU	1
503278	Microwave Measurements	ING-INF/02	6 CFU	1
503279	Computational Electromagnetics	ING-INF/02	6 CFU	1
505007	Electromagnetic Compatibility	ING-INF/02	6 CFU	1
505017	Satellite and Space Systems	ING-INF/01	6 CFU	1
505002	Electronic Instrumentation and Technologies	ING-INF/01	6 CFU	1
504443	Circuits and Systems for Wireline Communications	ING-INF/01	6 CFU	1
503272	VLSI Analogue-Digital Interfaces ICs	ING-INF/01	6 CFU	1
504462	Process Control	ING-INF/04	6 CFU	1
503272	VLSI Architectures for Digital Signal Processing (I)	ING-INF/01	6 CFU	1
504232	Sicurezza laser (I)	FIS/03	6 CFU	1
504462	Process Control	ING-INF/04	6 CFU	1
504702	Industrial Automation	ING-INF/04	6 CFU	1
505000	Radar Remote Sensing	ING-INF/02	6 CFU	2
505001	Inverse Scattering Techniques and Diagnostic	ING-INF/02	6 CFU	2
504240	Biofotonica A (I)	ING-INF/01	3 CFU	2
504241	Biofotonica B (I)	FIS/03	3 CFU	2
504708	Economics for the Digital Society	SECS-P/06	6 CFU	2
504464	Organisation Theory and Design	SECS-P/06	6 CFU	2
502466	Elettronica di potenza (I)	ING-INF/01	6 CFU	2
505060	Industrial topics in microelectronics	ING-INF/01	3 CFU	annual



505013	Advanced topics in microwave technologies	ING-INF/02	3 CFU	annual
503281	Progetto, gestione e produzione di beni e servizi (I) (Planning, management and supply of goods and services, in English in 2016)	choice	3 CFU	2
501246	Etica ambientale (I)	choice	3 CFU	2

Courses labeled (I) are delivered in Italian, and are used for equivalence purposes

**Table III- Elective courses at TAIPEI TECH for UPV students**

**1st Semester**

Code	Course Name	Credits	SSD
6505004	Experiments for Optoelectronic Engineering (I)	1.0	FIS/03
6505031	Integrated Optics	3.0	FIS/03
6505050	Design and Application of Optical Coating	3.0	ING-INF/02
6505054	Epitaxy Technology and Measurement	3.0	ING-INF/01
6505058	Electro-Optical Industry Trend Analysis	3.0	ING-IND/35
6505089	Lens Design	3.0	FIS/03
6505093	Electronics of Liquid Crystal Display	3.0	ING-INF/01
6505095	Introduction of Solar Cells Technology	3.0	ING-INF/01
6505114	Preliminary Flat-Panel Display	3.0	ING-INF/01
6505124	Lighting Design with TracePro	3.0	MAT/05

**2<sup>nd</sup> Semester**

Code	Course Name	Credits	SSD
6505005	Experiments for Optoelectronic Engineering (II)	1.0	FIS/03
6505028	Optical Communication	3.0 A	ING-INF/01



6505038	Flat Panel Display	3.0 C	ING-INF/01
6505090	Semiconductor Materials and Devices	3.0	ING-INF/01
6503532	Colorimetry	3.0	ING-INF/02
6505024	Fabrication of Photoelectronic Materials and Device	3.0	ING-INF/01
6505039	Diffraction Optical Elements and Applications	3.0	ING-INF/02
6505044	Dense Wavelength Division Multiplexing	3.0	ING-INF/03
6505052	Optics of Liquid Crystal Displays	3.0 C	FIS/03
6505096	Obtainment and Application of Property of High-Tech Patent	3.0	ING-IND/35
6505116	Introduction of Ultrafast Optics	3.0	FIS/03
6505131	Dialux Lighting Design	3.0	MAT/05
6505132	Ultrafast Optics and Application	3.0	FIS/03
6505049	Properties and Fabrication Techniques of Semiconductor Thin Film	3.0 D	ING-INF/01

### TAIPEI TECH's curriculum for UPV students

#### Year 1 Semester 1 (at UPV)

#	Pavia Course	SSD	CFU	Equivalence to TAIPEI TECH	Credit
1	Advanced Mathematical Methods	MAT/05	9	<i>The courses on the left are equivalent to "Introduction to Optoelectronic Engineering (I)" and "Semiconductor Materials and Devices"</i>	3
2	Optoelectronic Devices	ING-INF/01	9		3
3	Semiconductor Device Physics	FIS/03	6	<i>This course and "Microwaves" are equivalent to "Introduction to Optoelectronic Engineering (II)" and "Physics of Semiconductor Devices"</i>	3
4	Quantum Electronics	FIS/03	6	<i>This course is equivalent to "Experiments for Optoelectronic Engineering (I)" and "Engineering Seminar (1/4)".</i>	3



### Year 1 Semester 2 (at UPV)

	Pavia Course	SSD	CFU	Equivalence to TAIPEI TECH	Credit
5	Microwaves	ING-INF/02	9	<i>This course and "Semiconductor Device Physics" are equivalent to "Introduction to Optoelectronic Engineering (II)" and "Physics of Semiconductor Devices"</i>	3
6	Optical Communications	ING-INF/01	9	Fiber-Optic Communication	3
7	Nonlinear Optics	FIS/03	6	Nonlinear Fiber Optics and Application	3
8	Digital Communications	ING-INF/03	6	<i>This course is equivalent to "Experiments for Optoelectronic Engineering (II)" and "Engineering Seminar (2/4)".</i>	3

### Year 2 Semester 1 (at TAIPEI TECH)

	TAIPEI TECH Course	SSD	CFU	Equivalence to UPV
9	Elective Courses (ING-INF/01 from Table III)	ING-INF/01	12	Electro-optical instrumentation Microsensori, microsistemi integrati e MEMS
10	Elective Course (ING-INF/01 from Table III)	ING-INF/01	6	Industrial laser design
11	Diffraction Optical Elements and Applications OR Design and Application of Optical Coating	ING-INF/02	9	Antennas and propagation
12	Free Elective Course (one from Table III)		3	Biofotonica A



## Year 2 Semester 2 (TAIPEI TECH)

	TAIPEI TECH Course	SSD	CFU	Equivalence to UPV
13	Free Elective Course (one from Table III)		6	Sicurezza laser
14	Thesis / Internship		24	Thesis / Internship (Pavia or TAIPEI TECH)

Total CFUs of TAIPEI TECH curriculum for UPV students:

ING-INF/01 or /02: 49.5, ING-INF/03-FIS/03-MAT/05: 33, free elective: 15, thesis 24=121.5 total (Excess credits:1.5)

*Constraints of TAIPEI TECH (2 courses from 2 different research fields among the 4 ones with the courses mark A~D), and total credits are satisfied*