INTRODUCTION

The Diploma Supplement was developed by the European Commission, Council of Europe and by UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international transparency and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It is free from any value-judgements, equivalence statements or suggestions about recognition. Information is provided in eight sections. Where information is not provided, an explanation will give the reason why.

1 INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION

1.1 Family name(s)

LE CALVEZ

1.2 Given name(s)

ANTOINE CHRISTIAN

1.3 Date of birth (day/month/year)

12/11/1994

1.4 Student identification number or code (if available)

877258

2 INFORMATION IDENTIFYING THE QUALIFICATION

2.1 Name of the qualification and (if applicable) title conferred (in original language)

Laurea magistrale in TELECOMMUNICATION ENGINEERING
Dottore magistrale

2.2 Main field(s) of study for the qualification

LM-27 Telecommunications engineering

2.3 Name and status of awarding institution (in original language)

Politecnico di Milano (Università statale), Piazza Leonardo da Vinci 32, 20133 Milano

2.4 Name and status of institution (if different from 2.3) administering studies (in original language)

NA

2.5 Language(s) of instruction/examination

English

3 INFORMATION ON THE LEVEL OF THE QUALIFICATION

3.1 Level of qualification

2nd Cycle / 7° level of the NQF (National Qualifications Framework)

3.2 Official length of programme

Two years / 120 credits

3.3 Access requirement(s)

Laurea (First degree), or foreign comparable degree

4 INFORMATION ON THE CONTENTS AND RESULTS GAINED

4.1 Mode of study

The Course requires full time attendance and involves classroom and laboratory activities.

4.2 Programme requirements

Graduates will:
- possess in-depth knowledge of the theoretical and scientific aspects of mathematics and other base sciences and be able to use this knowledge to interpret and describe complex engineering problems or problems that require an interdisciplinary approach;
- possess in-depth knowledge of the theoretical and scientific aspects where complex problems that require an interdisciplinary approach can be identified, formulated and solved through an innovative approach;
- be able to ideate, plan, design and manage complex and/or innovative systems, processes and services;
- be able to design and manage highly complex experiments;
- possess context knowledge as well as the ability to think flexibly;
- possess knowledge of company and professional culture;
- be able to speak and write fluently in at least one European Union language, other than Italian, for professional purposes.

4.3 Programme details (e.g. modules or units studied) and the individual grades/marks/credits obtained

	CODE	COURSE UNITS	CFU/ECTS CREDITS	GRADE	DATE
	096109	RF SYSTEMS	10.00	29	01/02/2017
	088724	ELECTRONIC SYSTEMS	10.00	30	02/02/2017
	093268	OPTICAL COMMUNICATIONS	10.00	30 cum laude	14/02/2017
C	093294	INFORMATION THEORY	5.00	--	11/05/2017
C	094791	MICROWAVE ENGINEERING	5.00	--	11/05/2017
	089073	INTERNET OF THINGS	5.00	30 cum laude	26/06/2017
	091035	WIRELESS NETWORKS	10.00	30	27/06/2017
	096115	PHOTONIC DEVICES	10.00	28	29/06/2017
	089043	MULTIMEDIA INTERNET	10.00	30 cum laude	04/07/2017
	096120	COMMUNICATION NETWORK DESIGN	5.00	30	15/01/2018
	094179	OPTICAL MEASUREMENTS	5.00	30 cum laude	16/01/2018
	095398	ELECTROMAGNETIC COMPATIBILITY	5.00	25	19/01/2018
	096114	WIRELESS COMMUNICATIONS	10.00	30 cum laude	31/01/2018
	091081	FINAL EXAMINATION	20.00	--	11/07/2018

C) Recognition of prior learning.

4.4 Grading scheme and, if available, grade distribution guidance

Individual subjects are graded on a scale from 18 to 30, with 18 and 30 as minimum and maximum grade respectively. A "cum laude" can be added to the maximum grade as a special distinction.

GRADE DISTRIBUTION TABLE

GRADE	N marks	%	Cumulative %
18	285	9,11	9,11
19	103	3,29	12,40
20	170	5,43	17,83
21	165	5,27	23,10
22	175	5,59	28,69
23	200	6,39	35,08
24	270	8,63	43,71
25	252	8,06	51,77
26	286	9,14	60,91
27	282	9,02	69,93
28	252	8,06	77,99
29	157	5,02	83,01
30	298	9,54	92,55
30 cum laude	233	7,45	100,00

Total number of marks considered: 3128

The table shows the distributions of the marks obtained between 01/11/2014 and 31/10/2017, considering lessons given in study courses belonging to the same main field of study(s) for qualification of the graduate student.

4.5 Overall classification of the qualification (in original language)

Final mark: 110/110 cum laude, awarded on 25/07/2018
Final marks range from 66 to 110. A "cum laude" can be added to the maximum grade as a special distinction.

GRADE DISTRIBUTION TABLE

GRADE	N marks	%	Cumulative %
78	2	1.09	1.09
81	4	2.17	3.26
82	3	1.63	4.89
83	5	2.72	7.61
84	4	2.17	9.78
85	1	0.54	10.32
86	5	2.72	13.04
87	2	1.09	14.13
88	6	3.26	17.39
89	6	3.26	20.65
90	3	1.63	22.28
91	10	5.43	27.71
92	5	2.72	30.43
93	8	4.35	34.78
94	2	1.09	35.87
95	5	2.72	38.59
96	5	2.72	41.31
97	4	2.17	43.48
98	3	1.63	45.11
99	5	2.72	47.83
100	6	3.26	51.09
101	10	5.43	56.52
102	5	2.72	59.24
103	4	2.17	61.41
104	9	4.89	66.30
105	3	1.63	67.93
106	3	1.63	69.56
107	9	4.89	74.45
108	4	2.17	76.62
109	2	1.09	77.71
110	12	6.52	84.23
110 cum laude	29	15.77	100.00

Total number of final marks considered: 184

The table shows the distributions of the final marks obtained between 01/11/2014 and 31/10/2017 in courses belonging to the same main field of study(s) for qualification of the graduate student.

5 INFORMATION ON THE FUNCION OF THE QUALIFICATION

5.1 Access to further study

The qualification grants access to "Dottorato di Ricerca" (Research Doctorate), "Corso di Specializzazione di secondo livello" (2nd level Specialization Course) and "Master Universitario di secondo livello" (2nd level University Master)

5.2 Professional status (if applicable)

Gives access to the state exam required to practice as: ENGINEER OF COMPUTING SYSTEMS, JUNIOR ENGINEER OF COMPUTING SYSTEMS

6 ADDITIONAL INFORMATION

6.1 Additional information

6.2 Further information sources

http://www.polimi.it/; http://www.miur.it/;

7 CERTIFICATION OF THE SUPPLEMENT

7.1 Date (day/month/year) (*)

7.2 Name and signature (*)

Dott.ssa Assunta Marrese

7.3 Capacity

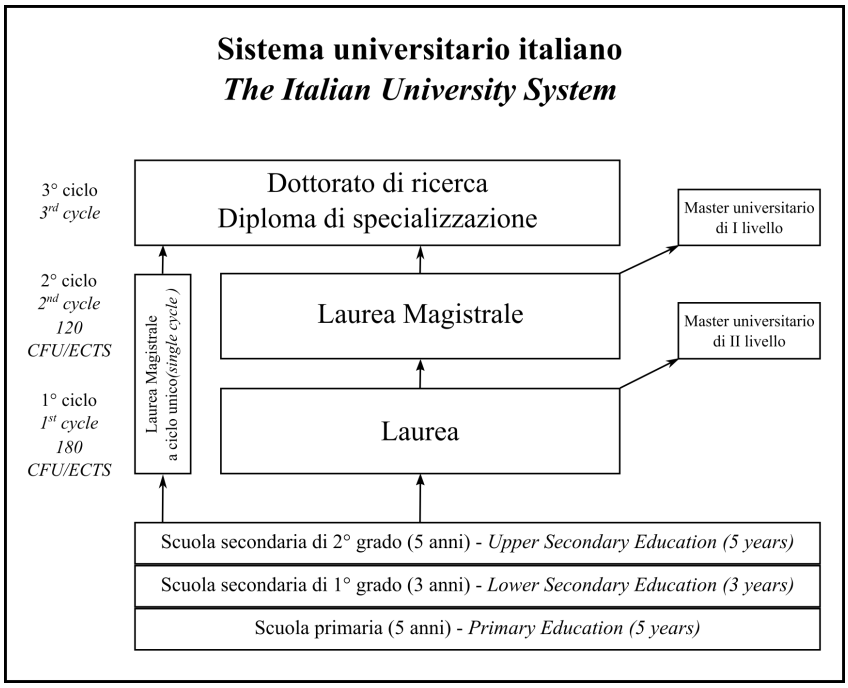
Il Dirigente dell'Area Servizi agli Studenti e ai Dottorandi

7.4 Official stamp or seal (*)

(*) Date, signature and stamp are available only if requested by the holder of the Diploma Supplement

8 INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM

The Italian university system is organised in three cycles, according to the Bologna structure: the main academic degrees are the Laurea (1st cycle), the Laurea Magistrale (2nd cycle) and the Dottorato di Ricerca (3rd cycle). The system also offers other study programmes and related qualifications.



First cycle

This cycle consists exclusively of Corsi di Laurea. These degree programmes provide students with an adequate command of general scientific methods and contents as well as with specific professional skills. The general access requirement is the Italian school leaving qualification awarded after completion of 13 years of schooling and passing the relevant State examination; comparable foreign qualifications may also be accepted. Admission to some degree courses may be based on specific course requirements. The studies last 3 years. The Laurea is awarded to students who have gained 180 ECTS credits (called Crediti Formativi Universitari - CFU) and satisfied all curricular requirements, including the production of a final written paper or equivalent final project. The Laurea gives access to the Corsi di Laurea Magistrale as well as to other 2nd cycle study programmes.

Second cycle

The main degree programmes in this cycle are the Corsi di Laurea Magistrale. They provide education at an advanced level for the exercise of highly qualified activities in specific areas. Access is by a Laurea degree or a comparable foreign degree; admission is based on specific course requirements determined by single universities. The studies last 2 years. The Laurea Magistrale degree is awarded to students who have gained 120 ECTS/CFU credits and satisfied all curricular requirements, including the production and public defence of an original dissertation.

Some programmes (namely, those in dentistry, medicine, veterinary medicine, pharmacy, architecture, construction engineering/architecture, law, primary education) are defined "single cycle programmes" (Corsi a ciclo unico); for these programmes access is by the Italian school

leaving qualification (or a comparable foreign qualification); admission is based on entrance exams. The studies last 5 years (6 years and 360 ECTS/CFU credits in the cases of medicine and dentistry). A Laurea Magistrale degree is awarded to students who have gained 300 ECTS/CFU credits and satisfied all curricular requirements, including the production and public defence of an original dissertation.
A Laurea Magistrale degree gives access to Corsi di Dottorato di Ricerca as well as to other 3rd cycle study programmes.

Third cycle

The main degree programmes in this cycle are Corsi di Dottorato di Ricerca (research doctorate programmes); the students/young researchers enrolled in these programmes will acquire methodologies for advanced scientific research, will be trained in new technologies and will work in research laboratories, wherever appropriate. Access is by a Laurea Magistrale degree (or a comparable foreign degree); admission is based on a competitive exam; studies last at least three years and include the completion and public defence of an original research project.

Other programmes

- Corsi di Specializzazione. These are 3rd cycle programmes intended to provide students with the knowledge and skills required for the practice of highly qualified professions, mainly in medical, clinical and surgical specialities. Admission is by a Laurea Magistrale degree (or by a comparable foreign degree) and is based on a competitive exam; studies may last from 2 (120 ECTS/CFU credits) to 6 years (360 ECTS/CFU credits) depending on the discipline. The final degree awarded is a Diploma di Specializzazione.
- Corsi di Master Universitario di primo livello. These are 2nd cycle programmes intended to provide students with further specialization or higher continuing education after completion of the first cycle. Access is by a Laurea degree (or a comparable foreign degree); admission may be subject to additional requirements. Studies last at least 1 year (60 ECTS/CFU credits). The qualification awarded (Master Universitario di primo livello) does not give access to Corsi di Dottorato di Ricerca or to any other 3rd cycle programme, since this type of course does not belong to the general requirements established at national level, but it is offered under the autonomous responsibility of each university.
- Corsi di Master Universitario di secondo livello. These are 3rd cycle programmes intended to provide students with further specialization or higher continuing education studies after completion of the second cycle. Access is by a Laurea Magistrale degree (or a comparable foreign degree); admission may be subject to additional requirements. Studies last at least 1 year (60 ECTS/CFU credits). The qualification awarded (Master Universitario di secondo livello) does not give access to Corsi di Dottorato di Ricerca or to any other 3rd cycle programmes, since this type of course does not belong to the general requirements established at national level, but it is offered under the autonomous responsibility of each university.

CREDITS

Degree courses are structured in credits (Crediti Formativi Universitari - CFU). University credits are based on the workload students need in order to achieve the expected learning outcomes. Each credit corresponds to 25 hours of student workload, including independent study. The average workload of a full time student is conventionally fixed at 60 credits per year. Thus, the CFU fully coincide with ECTS credits

Classes of Degree Courses

All degree programmes of Laurea and Laurea Magistrale sharing general educational objectives are grouped into "classes". In developing the specific learning outcomes of single programmes, Universities have to comply with some national requirements for each class concerning the types (and corresponding amount of credits) of teaching-learning activities to be included. Degrees belonging to the same class have the same legal value.

Academic Titles

Those who receive the Laurea are entitled to be called "Dottore", the holders of a Laurea Magistrale have a right to the title of "Dottore Magistrale", the Dottorato di ricerca confers the title of "Dottore di Ricerca" or "PhD".

Joint Degrees

Italian universities are allowed to establish degree programmes in cooperation with Italian and foreign partner universities, on completion of which joint or double/multiple degrees can be awarded.

Further information

Italian Qualifications Framework (Quadro dei Titoli Italiani - QTI) http://www.quadrodeititoli.it

1 INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION

1.1 Family name(s)

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1.2 Given name(s)

ANTOINE CHRISTIAN

1.3 Date of birth (day/month/year)

12/11/1994

1.4 Student identification number or code (if available)

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2 INFORMATION IDENTIFYING THE QUALIFICATION

2.1 Name of the qualification and (if applicable) title conferred (in original language)

Laurea magistrale in TELECOMMUNICATION ENGINEERING - INGEGNERIA DELLE TELECOMUNICAZIONI
Dottore magistrale

2.2 Main field(s) of study for the qualification

LM-27 Telecommunications engineering

2.3 Name and status of awarding institution (in original language)

Politecnico di Milano (Università statale), Piazza Leonardo da Vinci 32, 20133 Milano

Description of curriculum

RF SYSTEMS

Code: 096109
Credits: 10.00
Grade: 29
Date: 01/02/2017

Subject groups

ING-INF/02 ELECTROMAGNETIC FIELDS

The programme

Unavailable

ELECTRONIC SYSTEMS

Code: 088724
Credits: 10.00
Grade: 30
Date: 02/02/2017

Subject groups

ING-INF/01 ELECTRONIC ENGINEERING

The programme

1. OPERATIONAL AMPLIFIERS - Frequency response. Internal and external frequency compensation techniques. Special typologies of operational amplifiers: instrumentation (INA), isolation (ISO), current-feedback (CFA), current (CMA, Norton), and transconductance (OTA). Case studies of circuits employing OpAmps and SPICE circuital simulations. 2. CONVERTERS - Sample&Hold (S&H) with feedback. Stability, static and dynamic performances. Digital-to-Analog converters (DAC) and Analog-to-Digital converters (ADC): special architectures, errors, dynamic performances, spectra, timings. Advanced ADCs: interpolation, folding, half-flash, multistep, time-interleaving structures. Under- and Over-sampling. Sigma-Delta modulators: architectures, performances, commercial components. Case studies of circuits employing S&Hs, DACs and ADCs and SPICE circuital simulations. 3. MICROCONTROLLERS - Microcontrollers: characteristics, architectures, data-sheets. Development systems: programmers, simulators, emulators. Internal peripherals: I/O port, counter, timer, ADC, PWM. Auxiliary circuits: reset, oscillator, interrupt, watchdog. Case studies employing microcontrollers. Case studies of circuits employing µCs.

OPTICAL COMMUNICATIONS

Code: 093268
Credits: 10.00
Grade: 30 cum laude
Date: 14/02/2017

Subject groups

ING-INF/03 TELECOMMUNICATIONS

The programme

WDM optical communication systems. Direct and coherent detection: spectral power density, noise contributions, Signal to Noise Ratio. Direct detection, quantum-limited. Bit Error Rate. Introduction to light quantum theory. Statistical properties of the light. Stimulated emission. ASE noise. Master equation. EDFA, Raman and parametric amplifiers.

INFORMATION THEORY

Code: 093294
Credits: 5.00
Grade: --
Date: 11/05/2017

Subject groups

ING-INF/03 TELECOMMUNICATIONS

The programme

Unavailable

MICROWAVE ENGINEERING

Code: 094791
Credits: 5.00
Grade: --
Date: 11/05/2017

Subject groups

ING-INF/02 ELECTROMAGNETIC FIELDS

The programme

Unavailable

INTERNET OF THINGS

Code: 089073
Credits: 5.00
Grade: 30 cum laude
Date: 26/06/2017

Subject groups

ING-INF/03 TELECOMMUNICATIONS

The programme

Unavailable

WIRELESS NETWORKS

Code: 091035
Credits: 10.00
Grade: 30
Date: 27/06/2017

Subject groups

ING-INF/03 TELECOMMUNICATIONS

The programme

The course provides a comprehensive description of wireless networks using both methodological and technological perspectives. As for technologies, they cover those for mobile radio networks and for wireless internet access (WLAN, WMAN and WPAN). As for methodologies they consider network planning models (coverage and dimensioning), traffic and mobility models, and multiple access models.

PHOTONIC DEVICES

Code: 096115
Credits: 10.00
Grade: 28
Date: 29/06/2017

Subject groups

ING-INF/02 ELECTROMAGNETIC FIELDS

The programme

Materials and technologies: Materials for integrated optic circuits. Elasto-optical, electro-optical and magneto optical components. Technologies for integrated optic circuits: silicon glasses, silicon and lithium niobate. The photorefractive effect. UV-induced fiber Bragg gratings. Technological processes for the realization of passive components. Layer deposition, photolitography and etching. The packaging issue. Optical components: Isolator and circulator. Integrated-optic components. The propagation in planar guided-wave structures. Guided, radiative and leaky modes. The coupled mode theory. Bent waveguides, couplers and Y. Star couplers. Filters, (de)multiplexer and WGR. Switch. Integrated-optic modulators: phase and amplitude. Travelling wave electrodes. Fiber-optic grating: uniform, apodized and chirped. Optical circuits: The circuits for the photonic networks and switching. Components for Wavelength Division Networks. The wavelength routers. The wavelength converters. Switching fabric for optical signals. Add-drop and cross connects. Components and circuits for EDFA and SOA. Gain and noise figure. Cross-gain modulation e Cross-phase modulation. SOA for optical signal processing. Optical time-domain reflectometry. Optical spectrum analyzer. Optical low-coherence interferometry.

MULTIMEDIA INTERNET

Code: 089043
Credits: 10.00
Grade: 30 cum laude
Date: 04/07/2017

Subject groups

ING-INF/03 TELECOMMUNICATIONS

The programme

The first part of the course is focused on enabling Next-Generation network architectures for the delivery of high-quality multimedia services. Key services such as VoIP, multimedia streaming will be analyzed, both in a classic delivery framework and in peer-to-peer/P4P architectures (also for file sharing applications). Interworking among heterogeneous signalling architectures will be examined. The second part of the course is dedicated to the analysis and design of IP multimedia networks with quality of service.

COMMUNICATION NETWORK DESIGN

Code: 096120
Credits: 5.00
Grade: 30
Date: 15/01/2018

Subject groups

ING-INF/03 TELECOMMUNICATIONS

The programme

Unavailable

OPTICAL MEASUREMENTS

Code: 094179
Credits: 5.00
Grade: 30 cum laude
Date: 16/01/2018

Subject groups

ING-INF/07 ELECTRICAL AND ELECTRONIC MEASUREMENT

The programme

Measurements on optical sources: emission spectrum, spatial beam quality and divergence, polarization, optical power/energy, pulse duration, wavelength. Characterization of optical components and transmission media: reflection, transmission, attenuation, insertion loss. Measurements on transmission systems: PMD, OTDR, eye-diagram and BER, stability and crosstalk between WDM channels. Industrial measurements: interferometry, telemeters and laser triangulators, fiber-optical gyroscope.

ELECTROMAGNETIC COMPATIBILITY

Code: 095398
Credits: 5.00
Grade: 25
Date: 19/01/2018

Subject groups

ING-INF/02 ELECTROMAGNETIC FIELDS

The programme

Interference, problems of radiated and conducted emission/susceptibility; cross talk; electrostatic discharge. Design techniques: shields, hearth and grounds, filters, etc. Regulations and measurement techniques.

WIRELESS COMMUNICATIONS

Code: 096114
Credits: 10.00
Grade: 30 cum laude
Date: 31/01/2018

Subject groups

ING-INF/03 TELECOMMUNICATIONS

The programme

Modeling radio channels. Fading, multipath, Doppler effect. Transmission techniques. Digital modulation in radio systems, multicarrier modulation (OFDM). Diversity in radio systems. Use of multielements antennas (MIMO systems) and space-time coding. Spread spectrum systems. Multiple access: orthogonal systems (FDMA, TDMA) and code division (CDMA). Cellular systems and frequency reuse. Mobile systems. Wireless LAN and MAN.

FINAL EXAMINATION

Code: 091081
Credits: 20.00
Grade: --
Date: 11/07/2018

Subject groups

Unavailable

The programme

Unavailable