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Lappeenranta University of Technology



Erasmus
Mundus



LULEÅ
UNIVERSITY
OF TECHNOLOGY

PERCCOM JOINT DIPLOMA SUPPLEMENT

Pervasive Computing & COMMUNICATIONS for sustainable development

Erasmus Mundus Master Courses

1 INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION

1.1 Family name(s):

1.2 Given name(s):

1.3 Date of birth (*day/month/year*):

1.4 Student identification number or code:

2 INFORMATION IDENTIFYING THE QUALIFICATION

2.1 Name of qualification : Master of Science (Msc)

2.2 Main field(s) of study for the qualification: Computer Science, Network, Green ICT.

2.3 Name and status of awarding institution:

- University of Lorraine (France)
- Luleå University of Technology (Sweden)
- Lappeenranta University of Technology (Finland)
- Saint Petersburg National Research University of Information Technologies, Mechanics and Optics (Russia).

2.4 Name and status of institution administering studies: University of Lorraine (France)

2.5 Language(s) of instruction/examination: English

3 INFORMATION ON THE LEVEL OF THE QUALIFICATION

3.1 Level of qualification:

Master level

3.2 Official length of programme: 2 years

3.3 Access requirements(s) :

- Bachelor's degree of at least 180 ECTS in Computer Science, Computer Engineering, Automatic/ Electrical/ Electronics Engineering or Information Technology or a closely related area. Knowledge of computer networking, programming and operating systems is recommended.
- The grade average of the previous study should prove high qualification of the applicant. This will normally be the case for a grade average of 'B' or better in terms of the ECTS grading scale.
- Applicants need to prove that they have sufficient fluency in English. A TOEFL test with at least a score of 600 paper-based/250 computer-based/95 internet-based or an Academic IELTS score of at least 6.5 overall and with 6 in writing is required.

4 INFORMATION ON THE CONTENTS AND RESULTS GAINED

4.1 Mode of study: Full-time

4.2 Programme requirements:

The Master Program covers four semesters. **The students move as a single cohort for privileging the exchanges between the students coming from many different countries.** They start their first semester at University of Lorraine (France). The second semester, the cohort is at Lappeenranta University of Technology (Finland), and the third one at Luleå University of Technology (Sweden). The last semester is dedicated to a thesis component and can be undertaken during the training period either in a private company or in one of the laboratories/departments of the different Universities involved in the Master Program.

- **Seminars:** The associated partner universities propose additional courses presented during seminars. These courses give ECTS. In the same way, the companies associated to the PERCCOM Master consortium contribute lectures oriented towards green business & technology and participate in the student evaluation. The companies have a role to assess the training content in regard to the market demand evolution. **Saint Petersburg National Research University of Information Technologies, Mechanics and Optics** organizes the seminar in the semester 2. It means all the students move from Lappeenranta to St Petersburg for a short period (around 10 days). The objectives of this seminar are to educate students in green data storage, to organize meeting with Russian researchers and Russian companies and to immerse students in Russian culture.

4.3 Programme details:

Objectives of semesters and List of courses:

Semester 1: Sustainable Computer Network Engineering (30 ECTS) *The objective is to provide students with fundamental competences in computer networks and in eco-design.*

All the courses are delivered at the University of Lorraine, but other partners contribute either in the context of seminar and of student projects.

Course 1: **Communication protocols** (3.5 ECTS)

Course 2: **Quality of Sustainable Service** (3.5 ECTS)

Course 3: **Automatic Control for Sustainable Development** (3.5 ECTS)

Course 4: **Systems Engineering** (3.5 ECTS)

Course 5: **Sustainable development & circular economy** (3.5 ECTS)

Course 6: **Specification definition of Master thesis project** (6 ECTS)

Course 7: **French Culture and Language** (3 ECTS)

Seminar: (3.5 ECTS) a selection (done by the Universities) of two courses provided by other Partners.

Semester 2: Sustainable software and services. (30 ECTS) The objective is to educate students in software engineering, service engineering and cloud computing aspects that may result in sustainable solutions. Sustainable software and services address challenges for building resource efficient software solutions. The courses are organized at the Lappeenranta University of Technology and the seminar is organized at Saint Petersburg National Research University of Information Technologies, Mechanics and Optics.

Course 8: **Service Oriented Architecture** (5 ECTS)

Course 9: **Code camp on Communications Engineering** (4 ECTS)

Course 10: **Architecture in Systems and Software Development** (7 ECTS)

Course 11: **Research methods laboratory project** (5 ECTS)

Course 12: **Finnish Society and Culture** (2 ECTS)

Course 13: **Towards Semester 3** (1 ECTS)

Seminar: (2*3ECTS) a selection (done by the Universities) of two courses provided by other Partners.

Semester 3: Resource efficient pervasive computing systems and communications. (30 ECTS) The objective is to teach students fundamentals and advanced issues of mobile networks, mobile and distributed systems, energy efficient sensor networks, pervasive computing and mobile software and services. The students will learn how to apply acquired knowledge to various application domains focusing on sustainable development. The courses are given at Luleå University of Technology.

Course 14: **Network programming and distributed applications** (7.5 ECTS)

Course 15: **Wireless sensor networks/ Wireless Mobile Networks** (7.5 ECTS)

Course 16: **Multimedia Systems** (7.5 ECTS)

Course 17: **Special Studies in Pervasive and Mobile Computing (Project)** (3 ECTS)

Course 18: Swedish for Beginners AI:1a - (1.5 ECTS)

Seminar: (3ECTS) a selection (done by the Universities) of one course offered by other Partners.

Semester 4: Master Thesis project (30 ECTS) The objective is to pursue a Master Thesis project at partner universities and/or affiliated industrial companies for the whole semester. Each student will have two supervisors from University and/or company where (s)he is doing his/her Master thesis project. Assessment will be done on the basis of one written thesis.

In PERCCOM program, a Master thesis topic area is allocated to each student in semester 1. The list of Master theses topics will be presented on the PERCCOM website at the beginning of the semester 1. The students will have time to consult all the proposals. A virtual market place of potential Master thesis projects will be held during semester 1 where students will have the opportunity to discuss possible projects with consortium partners. Each hosting University during semesters 1-3 gives a course dedicated to preparation of a Master Thesis and teaches how to write reports, make oral presentations and manage a project.

Examples of courses offered during the seminars:

- **Developing Green IT Strategies**, Leeds Metropolitan University,
- **ICT & Environment**, Leeds Metropolitan University,
- **Sustainable (Green) computing**, University of Bradford,
- **Participatory Urban Sensing**, University of Cyprus,
- **Sustainable microelectronics**, University of Monastir,
- **Sustainable electronics**, University of Monastir,
- **Models and Methods of high-performance computing considering energy consumptions**, Saint Petersburg National Research University of Information Technologies, Mechanics and Optics,
- **Stochastic simulation models for energy transfer**, Saint Petersburg National Research University of Information Technologies, Mechanics and Optics
- **Pervasive systems** , Commonwealth Science and Industrial Research Organization.

Transcript of study :

	Courses	Hours (Effort student)	ECTS Credits	ECTS Grade
C1	<i>Communication protocols</i>		3.5	A,...,E
C2	<i>Quality of Sustainable Service</i>		3.5	A,...,E
C3	<i>Automatic Control for Sustainable Development</i>		3.5	A,...,E
C4	<i>Systems Engineering</i>		3.5	A,...,E
C5	<i>Sustainable development & circular economy</i>		3.5	A,...,E
C6	<i>Specification definition of Master thesis project</i>		6	A,...,E
C7	<i>French Culture and Language</i>		3	A,...,E
S1	<i>Seminar 1</i>		3.5	A,...,E
C8	<i>Service Oriented Architecture</i>		5	A,...,E
C9	<i>Code camp on Communications Engineering</i>		4	A,...,E
C10	<i>Architecture in Systems and Software Development</i>		7	A,...,E
C11	<i>Research methods laboratory project</i>		5	A,...,E
C12	<i>Finnish Society and Culture</i>		2	A,...,E
C13	<i>Towards Semester 3</i>		1	A,...,E
S2	<i>Seminar 2</i>		2	A,...,E
S3	<i>Seminar 3</i>		2	A,...,E
C14	<i>Network programming and distributed applications</i>		7.5	A,...,E
C15	<i>Wireless sensor networks/ Wireless Mobile Networks</i>		7.5	A,...,E
C16	<i>Multimedia Systems</i>		7.5	A,...,E
C17	<i>Special Studies in Pervasive and Mobile Computing</i>		3	A,...,E
C18	<i>Swedish for Beginners AI: 1a</i>		1.5	A,...,E
S4	<i>Seminar 4</i>		3	A,...,E
MT	<i>Master Thesis</i>		30	A,...,E

Overall classification : Distinction/Merit/pass ?

4.4 Grading scheme :

The assessment process will be carried out by the **Admission & pedagogical management board**. There are four periods of evaluation: one at the end of each semester. All ECTS delivered in the PERCCOM Master will be recognized by all the partners in their respective local Master.

The rules to obtain ECTS are the same than the ones define in the Bologna process. The ECTS system initially divides students between pass and fail groups, and then

assesses the performance of these two groups separately. Those obtaining passing grades are divided into five subgroups: the best 10% are awarded an A-grade, the next 25% a B-grade, the following 30% a C-grade, the following 25% a D-grade and the final 10% an E-grade. Those who have not achieved a performance sufficient to allow a passing grade are divided into two subgroups: FX (Fail – some more work required before credit can be awarded) and F (Fail – considerable further work is required). This distinction allows differentiation between those students who have been assessed as almost passing and those who have clearly lacked the required knowledge and skills

The student has to obtain at least an E-grade in each teaching course to receive the PERCCOM master degree. If the student obtains F or FX-grade, a second examination is organized in respecting the same examination procedure.

4.5 Overall classification of the qualification:

The overall classification is estimated as follow:

- 1) The letters A, B, C, D and E obtained in each course are translated in a numerical score respectively 5, 4, 3, 2, 1.
- 2) The ECTS corresponds to the weight associated to each course
- 3) The global score is the weighted (ECTS) mean of each numerical score.
- 4) The overall classification uses the mechanism described in 4.4.

5 INFORMATION ON THE FUNCTION OF THE QUALIFICATION

5.1 Access to further study: Qualifies to apply for admission to doctoral studies. But the final decision to be admitted for doctoral studies is given by the local doctorate schools. The publication of Master thesis results in scientific conference and/or journal is highly recommended.

5.2 Professional status:

Executive position in companies: The targeted jobs are ICT professionals and engineers in ICT companies (Cisco, Ericsson, Nokia, Microsoft, Orange,...) or in companies having their own ICT staff. The main economic sectors concerned are transportation, logistics, energy delivery networks, construction and manufacturing industry. Thanks to their broad scope and European view these students are well prepared to manage a department in companies, as:

- **ICT manager.** Their training in teamwork enables these students to become project leader of a multinational and multicultural project team.
- **R&D-department**, working as a project leader on applied research.

Other positions : The broad view on ICT, the capability in making judgements, integrating environment, cultural, social, ethical insights make them very well suited for the following functions:

- **Consultancy** in a wide spectrum of functions in the domain of green ICT architect.
- **Government/public** for industry, for environment, for urban/territorial planning/management.

6 ADDITIONAL INFORMATION

6.1 Additional information:

The Qualifications are :

- Master in Master in Complex Systems Engineering (University of Lorraine)
- Master in Pervasive Computing and Computers for sustainable development (Lulea University of Technology)
- Master of Science with a major in Computer Science, specialisation Mobile Systems (Lappeenranta University of Technology)

6.2 Further information sources:

On the programme: www.perrcom.

On the Universities: www.univ-lorraine.fr

www.ltu.se

<http://www.lut.fi>

<http://en.ifmo.ru/>

7. CERTIFICATION OF THE SUPPLEMENT

7.1 Date:

7.2 Signature:

7.3 Capacity:

7.4 Official stamp or seal:

8 INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM