International Master's Degree Programme in Wireless Communication Engineering (WCE)

Curriculumn for Student Group 2013-2015

1. Structure of WCE Studies

M.Sc. degree of WCE programme consist of 120 ECTS credits of studies based on the modules described below. 60 ECTS credits measure the workload of a full-time student during one academic year, which equals around 1500-1800 hours per year. Thus one ECTS credit stands for 25-30 working hours. The structure of WCE studies is organized in the following manner:

Basic WCE studies module (41 ECTS)
Advanced WCE studies module (28-29 ECTS)
Optional WCE studies module (≥ 17-18 ECTS)
Advanced practical training (3 ECTS)
Master's (Diploma) Thesis work (30 ECTS)
In total 120 ECTS

ECTS = European Credit Transfer System, 1 credit 25-30 hours, 1 year ca. 60 credits

All WCE courses are implemented in English. Execution of the WCE programme consist of passing the courses contained in the basic, advanced and optional (elective studies) modules. All courses within the basic and advanced modules must be completed. There is freedom to choose elective courses from the optional module. At least 17-18 ECTS of elective studies must be chosen. The total number of elective credits (17 or 18 ECTS) depends on whether *Antennas* (4 ECTS) or *Radio channesl* (5 ECTS) course is included into obligatory advanced study courses. This issue also influences on the required number of advanced studies (28 or 29 ECTS). In addition, master's thesis thesis work (equals 6 months workload) and advanced practical training (equals 2 months workload) must be done.

WCE courses are provided by the departments of Communications Engineering (DCE), Electrical Engineering (EE), and Computer Science and Engineering (CSE) at the Faculty of Technology. ***In order to retain the UO scholarship covering the tuition fee of 10500 Euros totally in the second year of study, a WCE student must have completed 45 ECTS of WCE courses by the end of their first academic year (July 31, 2014).***

Student can include courses from DCE, EE, CSE, or even from other departments/faculties into his/her optional module (elective studies) provided they are accepted into student's personal study plan (PSP) by the academic coordinator (Dr. Kari Kärkkäinen). Always consult him before including elective courses taugth by other departments than DCE into your PSP.

If a student has study transfers/compensations from his/her previous studies conducted elsewhere based on the UO process of recognition of prior learning (PRL) (http://www.oulu.fi/english/studying/supporting-your-studies/recognition-prior-learning-rpl), those compensating credits are not counted into the 45 ECTS requirement of UO Scholarship. ***Only credits of WCE curriculumn's courses done during the study year 2013-15 will increase the credit sum which is compared to the 45 ECTS requirement at the end of July 2014.*** This also applies for the studies of the second year (i.e. student have to pass at least 90 ECTS to retain UO scholarship for the third study year). However, it is recommended to graduate within two years.

If a student fails to pass an exam, she/he can try again on next final exam date of that course. Typically 3-4 exams are arranged per year for each course. ***Notice, no restrictions are imposed on the number, and time-span of taken exams for each course, i.e,. if you fail an exam, you can retry during next exams and study years.*** Also, if you are not satisfied with your grade, you can try to upgrade your grade in next exams without restrictions. ***Exams are written with a pencil***. Use of permanent ink pen is not mandatory, and also it is not recommended.

Every WCE student has to submit an electronic personal study plan (PSP) to the programme's academic coordinator and tutoring teacher (Dr. Kari Kärkkäinen) for approval at the beginning of studies. Instructions info session for creation of a PSP will be arranged at the beginning of autumn term. PSP is prepared with the aid of OodiPSP tool: http://www.oulu.fi/oodi/english.html.

2. General Issues Dealing with Studies

A study year at the DCE department is divided into 6 periods. Periods 1, 2 and 3 run on autumn (**A**) term, and periods 4, 5 and 6 run on spring (**S**) term. Time span for each period is 5 weeks. Thus, each study year consists of 30 weeks of teaching. Between 3rd and 4th periods there is a season break for the Christmas & New Year. No teaching and exams are arranged during that holiday season. The exact dates for the periods of the study year 2013-2014 are: 1st: 2.9.-4.10.2013 (weeks 36-40) , 2nd: 7.10.-8.11.2013 (weeks 41-45), 3rd: 11.11.-13.12.2013 (weeks 46-50), 4th: 13.1.-14.2.2014 (weeks 3-7), 5th: 17.2.-28.3.2014 (weeks 8-13), 6th: 31.3.-9.5.2014 (weeks 14-19).

University of Oulu orientation programme for all international master's degree students is arranged at the beginning of September, 2013 (week 36). ***It is recommend that WCE students could arrive in Oulu before the start of orientation programme in order to settle down and to get useful training and information in order to get started.*** After orientation week on week 37 starts the WCE studies of 1st period of the study year 2013-2014.

At the beginning of studies during the orientation week a WCE student will get his/her personal UO e-mail account and license to use UO computer network, i.e. UID & PW are given. Those computer systems are needed in executing exercise/design works for courses of WCE curriculumn, as well as, to access lecture and exercise materials in pdf-format.

3. Electronic Study Environments at UO

Course materials are typically stored into the TTK-OPTIMA portal: https://optima.oulu.fi/. OPTIMA is an interactive study environment for students and teachers in order to share study materials and work assignements. It is also a communication channel between teachers and students.

NOPPA study portal (https://noppa.oulu.fi/noppa/kurssit/) is an public (i.e. no UID & PW needed) study environment where home pages, learning outcomes and up-to-date information dealing with execution of courses are located (lecture & exercise & exercise work schedules, course books, mode of delivery, etc.).

LUKKARI (https://lukkari.oulu.fi/) is an electronic study time management environment where you can create your own course calendar, store coming exam dates, personal appointment times, etc. during study terms.

WEBOODI (https://weboodi.oulu.fi/oodi/) is an environment where all official detailed course descriptions including course books, timing periods, mode of delivery and requirements are located.

In addition, ***students register for courses (before course starts) and exams with WEBOODI***. When you register to a course or exam with the aid of WEBOODI, those registrations appear automatically in your personal LUKKARI course calendar. ***When registering for an exam using WEBOODI you always has to ask exam questions in English.*** Failing to register means that you cannot participate the exam. Your personal student tutor will advice you at the beginning of your studies how to use those four computer-based study environments.

4. Curriculum Schedule for WCE Students Starting in September 2013 (Student Group 2013-2015)

Basic Module (all courses obligatory)	Course code	ECTS	Suggested study year	Precise course timing	Lecturer
Introduction to Optimization	031025A	5	1	A2013 (per. 1-2)	Prof. Keijo Ruotsalainen
Elements of Information Theory and Coding	521321S	5	1	A2013 (per. 1-3)	Prof. Markku Juntti (IT) & University Teacher Timo Kokkonen (Coding)
Mobile Telecommunication Systems	521385S	5	2	A2014 (per. 1-3)	Prof. Marcos Katz
Wireless Communications I	521320S	8	1	A2013 (per. 1-3)	Prof. Jari Iinatti
Communication Networks I	521340S	5	1	A2013 (per. 1-3)	Prof. Savo Glisic
Communication Signal Processing I	521373S	6	1	S2014 (per. 4-5)	Prof. Markku Juntti
Radio Engineering I	521335S	6	1	A2013 (per. 1-3)	University teacher Risto Vuohtoniemi
Seminar in Telecom. & Radio Engineering	521350S	1	2	A2014–S2015 (per. 1-6)	Prof. Jari Iinatti
total		41			

Advanced Module (all courses obligatory)	Course code	ECTS	Suggested study year	Precise course timing	Lecturer
Communication Networks II	521377S	7	1	S2014 (per. 4-6)	Prof. Savo Glisic
Radio Engineering II	521375S	5	1	S2014 (per. 4-6)	University Teacher Risto Vuohtoniemi
Wireless Communications II	521317S	8	1	S2014 (per. 4-6)	Senior Research Fellow Antti Tölli
Communication Signal Processing II	521360S	4	2	A2014 (per. 2-3)	Prof. Markku Juntti
Antennas	521380S	4	1	S2014 (per. 4-6) *¤	University Researcher Markus Berg
Radio Channels	521386S	5	2	S2015 (per. 4-6) #¤	University Researcher Markus Berg
total		28-29			

* = Lectured only on even years 2014, 2016, 2018, …
# = Lectured only on odd years 2015, 2017, 2019, …
¤ = It is mandatory to choose one of these courses into your advanced module. If you wish to do both courses, then the other one should be placed into the optional module. The number of credits you take into advanced module (28 or 29 ECTS) will influence to the required number of credits in optional module (17 or 18 ECTS).

With the elective courses of an optional module a student can extent his/her knowledge from wireless communications e.g. into the areas of practical electronics design and computer science & engineering. Notice there are some recommentations depending on your interests. You are anyway free to choose the elective courses you like. You have to choose at least 17-18 ECTS of elective courses depending on how many credits are contained in your advanced module. You can do courses more than the minimum ECTS requirement if you wish. ***It is also possible to include at most 4 ECTS of Finnish language studies into your optional module***.

Optional Module (elective studies)	Course code	ECTS	Suggested study year	Precise course timing	Lecturer
Modern Topics in Telecommunications and Radio Engineering	521318S	3-7	2	annually *, (per. 1-6) ♥	Lecturers announced yearly, Prof. Matti Latva-aho is a course coordinator
Electronics Design II	521443S	5	2	A2014 (per. 1-2) ♠	Prof. Juha Kostamovaara
Laboratory Exercises on Analogue Electronics	521433A	3	2	A2014–S2015 (per. 1-6) ♠	University Lecturer Kari Määttä
Biosignal processing	521273S	5	2	A2014 (per. 2-3) ♣	Prof. Tapio Seppänen
Digital Video Processing	521259S	5	2	A2014 (per. 2-3) ♣	Prof. Janne Heikkilä
Human Computer Interaction	521145A	5	2	A2014 (per. 2-3) ♣	Prof. Vasillis Kostakos
Multimedia Systems	521488S	6	2	A2012 (per. 2-3) ♣	University Researcher Mika Rautiainen
Signal Processing Systems	521279S	5	2	A2014 (per. 1-3) ♣	Prof. Jari Hannuksela
Ubiquitous Computing Fundamentals	521148S	5	2	A2014 (per. 2-3) ♣	Prof. Timo Ojala
Application Specific Signal Processors	521281S	5	2	S2015 (per. 4-5) ♣	University Researcher Jani Boutellier
Computer Graphics	521493S	7	2	S2015 (per. 5-6) ♣	Dr. Guoying Zhao, Dr. Jie Chen, Jukka Holappa
Distributed Systems	521266S	6	2	S2015 (per. 4-5) ♣	Prof. Timo Ojala
Machine Vision	521466S	5	2	S2015 (per. 5-6) ♣	Janne Heikkilä
Mobile and Social Computing	521147S	5	2	S2015 (per. 4-5) ♣	Prof. Vasillis Kostakos

Pattern Recognition and Neural Networks	521497S	5	2	S2015 (per. 5-6) ♣	Prof. Tapio Seppänen
Programmable Web Project	521260S	5	2	S2015 (per. 4-6) ♣	Prof. Jukka Riekki
Software Project	521479S	7	2	S2015 (per. 4-6) ♣	Prof. Juha Röning
DSP Laboratory Work	521280S	5	2	S2015 (per. 2-6) ♣	Miguel Bordallo López
Survival Finnish Course	900017Y	2	1,2	announced at the beginning of semester #	UO language center/open university
Beginner's Finnish I Course	900013Y	2	1,2	announced at the beginning of semester #	UO language center/open university
Beginner's Finnish II Course	900053Y	4	1,2	announced at the beginning of semester #	UO language center/open university
total		≥ 17-18			

TBD = Lecturer to be determined by the beginning of course.

* = Exact topics will be announced at the beginning of each term. Typically there will be several topics for each study year. Notice also, you can choose several course topics under this "umbrella course" 521318S.

♥ = This course is recommended for all WCE students.

♠ = If you are interested in electronics design these courses are recommended.

♣ = If you are interested in computer science & engineering issues to widen your expertise, a proper collection from these courses is recommended.

\# = See details of timing either from WEBOODI (https://weboodi.oulu.fi/oodi/) or from NOPPA (https://noppa.oulu.fi/noppa/app), or from UO language center's web page: http://webcgi.oulu.fi/kielikeskus/index.php?a=o&s=KurssitMuut.html&v=suomiMuut

Other obligatory studies included in WCE Master's degree	**Course code**	**ECTS**	**Suggested study year**	**Precise timing**
Advanced practical training (icludes also a written training report)	521016A	3	after first study year	2 months of workload equals 3 ECTS; suggested in summer 2014
M.Sc. (Diploma) thesis work	521998S	30	2	A2014–S2015
Written English language proficiency test		0	2	after written master's thesis is ready
total		33		

Course describtions, learning outcomes and detailed content of all courses can be found in electronic form by from the WEBOODI portal: https://weboodi.oulu.fi/oodi/

Up-to-date info dealing with courses can be found from the NOPPA portal: https://noppa.oulu.fi/noppa/app

Courses are also described in the pdf-version of official study quide of Faculty of Technology, the book you will receive when enroll to university: http://www.oulu.fi/ttk/node/298