



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

### Curriculum for Student Group 2012-2014

M.Sc. degree of WCE programme consist of 120 ECTS credits of studies based on the modules described below (41 + 33 + 13 + 3 + 30 = 120). 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 (33 ECTS)
Optional WCE studies module ( $\geq 13$ ECTS)
Advanced practical training (3 ECTS)
M.Sc. (Diploma) Thesis work (30 ECTS)
In total 120 ECTS

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

Execution of the WCE programme consist of passing the courses contained in the basic, advanced and optional modules. All courses within the basic and advanced modules must be completed. There is freedom to choose elective courses from the optional (supplementary) module. At least 13 ECTS of elective studies must be chosen. All WCE courses are implemented in English. 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.

Other B.Sc. and M.Sc. level courses taught in Finnish in electrical engineering (EE) and information engineering (IE) programs at the DCE, EE and CSE departments cannot ne included into the M.Sc.(Tech.) degree of WCE programme. Of course, WCE students are free to pass such courses since exams are available in English, but those courses cannot be included into the personal study plan (PSP). The complete list of B.Sc. and M.S. level EE and IE courses offered by the DCE, EE and CSE departments can be found from here:

<http://www.ee.oulu.fi/Opiskelijat/KurssitJaTentit/Kurssiluettelo>

Those EE and IT program courses that do not belong into the course set of WCE programme are not counted into the 45 ECTS requirement of UO Scholarship, so doing a lot of them them is not a reasonable use of student's time. In addition, if a student has study transfers/compensations from his/her B.Sc. degree, those compensations are not counted into the 45 ECTS requirement of UO Scholarship. *Only credits of WCE curriculum's courses done during the study year 2012-13 will increase the credit sum that is compared at the end of first study year to the 45 ECTS requirement.*

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.

Every WCE student has to submit an electronic personal study plan to the programme's coordinator for approval at the beginning of studies. It is prepared with the aid of OodiPSP system: <http://www.oulu.fi/oodi/english.html>. Training how to use OodiPSP tool and how to prepare your PSP will be arranged at the orientation phase of studies in autumn term.

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 3<sup>rd</sup> and 4<sup>th</sup> periods there is a holiday 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 2012-2013 are: 1<sup>st</sup>: 3.9.-5.10.2012, 2<sup>nd</sup>: 8.10.-9.11.2012, 3<sup>rd</sup>: 12.11.-14.12.2012, 4<sup>th</sup>: 7.1.-8.2.2013, 5<sup>th</sup>: 11.2.-22.3.2013, 6<sup>th</sup>: 25.3.-10.5.2013.

University of Oulu orientation programme for all international master's degree students is arranged at the beginning of September, 2012 (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 starts the 1<sup>st</sup> period of the study year 2012-2013.

### Curriculum Schedule for WCE Students Starting in September 2012 (Student Group 2012-2014)

At the beginning of studies in September 2012 a WCE student will get a personal e-mail account and rights to use UO computer networks, i.e. UID & PW are given. Those computer systems are needed in executing exercise/design works for courses of WCE curriculum, as well as, to access lecture and exercise pdf-materials stored into the OPTIMA portal: <https://optima.oulu.fi/>.

Basic module (all courses obligatory)	Course code	ECTS	Suggested study year	Precise course timing	Lecturer
Elements of Information Theory and Coding	521321S	5	1	A2012 (per. 1-3)	Prof. Markku Juntti (IT) & Lecturer Timo Kokkonen (Coding)
Mobile Telecommunication Systems	521385S	5	1	S2013 (per. 4-6)	Prof. Marcos Katz
Wireless Communications II	521320S	8	1	A2012 (per. 1-3)	Prof. Jari Iinatti
Communication Networks I	521340S	5	1	A2012 (per. 1-3)	Prof. Savo Glisic
Seminar in Telecom. & Radio Engineering	521350S	1	2	A2013–S2014 (per. 1-6)	Prof. Jari Iinatti
Communication Signal Processing I	521373S	6	1	S2013 (per. 4-5)	Prof. Markku Juntti
Introduction to Optimization	031025A	5	1	A2012 (per. 1-2)	Prof. Keijo Ruotsalainen
Radio Engineering I	521335S	6	2	A2013 (per. 1-3)	Lecturer Risto Vuhtoniemi
total		41			

Advanced module (all courses obligatory)	Course code	ECTS	Suggested study year	Precise course timing	Lecturer
Communication Networks II	521377S	7	1	S2013 (per. 4-6)	Prof. Savo Glisic
Radio Engineering II	521375S	5	2	S2014 (per. 4-6) *	Lecturer Risto Vuohtoniemi
Wireless Communications III	521317S	8	1	S2013 (per. 4-6) #	Prof. Matti Latva-aho
Communication Signal Processing II	521360S	4	1	S2013 (per. 5-6) #	Prof. Jari Iinatti
Antennas	521380S	4	2	S2014 (per. 4-6) *	Lecturer Markus Berg
Radio Channels	521386S	5	1	S2013 (per. 4-6) #	Lecturer Markus Berg
total		33			

\* = lectured only on even years 2014, 2016, 2018, ...

# = lectured only on odd years 2013, 2015, 2017, ...

With the elective courses of an optional/supplementary module a student can extend his/her knowledge from wireless communications into the areas of practical electronics design, computer engineering, computer networking, multimedia, and software related issues. Notice there are some recommendations depending on your interests. You are anyway free to choose the elective courses you like. You have to choose at least 13 ECTS of elective courses. It is possible to include at most 4 ECTS of Finnish language studies into your optional/supplementary module.

Optional/Supplementary Module (elective studies)	Course code	ECTS	Suggested study year	Precise course timing	Lecturer
Electronics Design II	521443S	5	1	A2012 (per. 1-2) ♠	Prof. Juha Kostamovaara
Laboratory Exercises on Analogue Electronics	521433A	3	1	A2012–S2013 (per. 1-6) ♠	Prof. Kari Määttä
Multimedia Systems	521488S	6	1	A2012 (per. 2-3) ♣	Lecturer Mika Rautiainen
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
Programmable Web Project	521260S	5	2	S2014 (per. 4-6) ♠, ♣	Prof. Jukka Riekkö
Distributed Systems	521266S	6	2	S2014 (per. 4-5) ♣	Prof. Timo Ojala
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
at least 13 ECTS must be chosen from these courses		≥ 13			

\* = Exact topics will be announced yearly. 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 both electronics design and basics of computer networks issues, these courses are recommended.

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

# = See details of timing: <http://webcgi.oulu.fi/kielikeskus/index.php?a=o&s=KurssitMuut.html&v=suomiMuut>

<b>Other obligatory studies included in WCE master's degree</b>	<b>Course code</b>	<b>ECTS</b>	<b>Suggested study year</b>	<b>Precise timing</b>
Advanced practical training (includes also a written training report )	521016A	3	1,2	2 months of workload equals 3 ECTS; suggested in summer 2013
M.Sc. (Diploma) thesis work		30	2	A2013–S2014
Written English language proficiency test		0	2	after written master's thesis is ready
total		33		

Course descriptions, learning outcomes and detailed content of all courses can be found in electronic form by using Oodi portal: <https://weboodi.oulu.fi/oodi/>

Courses are also described in pdf-version of printed study guides: <http://www.oulu.fi/ttk/node/298>