WCE CURRICULUM CONTENT

MODULES & COURSES & TIMING

Admission Group 2017-2019
WCE Curriculum

• WCE curriculum is mainly organized by ITEE Faculty’s
  • CWC Radio Technologies (CWC-RT) research unit
  • CWC Networks and Systems (CWC-NS) research unit
  • Circuit and Systems (CAS) research unit

• WCE study specialization options (can be chosen freely after admission in student’s personal study plan):
  • Wireless Communications Engineering – Radio Access and Networks (WCE–RAN)
  • Wireless Communications Engineering – RF Engineering (WCE–RF)
## WCE Contents

<table>
<thead>
<tr>
<th>Module</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic WCE studies module (RAN: 40, RF: 41)</td>
<td>41</td>
</tr>
<tr>
<td>Advanced WCE studies module (RAN: 25, RF: 31)</td>
<td>31</td>
</tr>
<tr>
<td>Optional WCE studies module (RAN: ≥ 22, RF: ≥15)</td>
<td>≥15 ECTS</td>
</tr>
<tr>
<td>Advanced practical training</td>
<td>3 ECTS</td>
</tr>
<tr>
<td>Master’s (Diploma) Thesis work</td>
<td>30 ECTS</td>
</tr>
</tbody>
</table>

In total 120 ECTS

University of Oulu holds ECTS label certificate

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

• WCE output: *R&D professionals specialized in wireless radio system design*
  – in RF engineering (RF option) or
  – in physical and network layers (radio access and networks RAN option)

• Learning outcomes of WCE M.Sc.(Tech.) graduates¹):
  – Mathematics of optimization
  – Statistical signal processing
  – Communications signal processing
  – Information theory & coding methods
  – Communications network theory
  – Future radio access technologies (5G, etc.)
  – Mobile cellular communication systems design
  – Radio channels
  – Antenna & radio frequency engineering
  – Several computer engineering, DSP and multimedia subjects
  – Electronics design courses
  – Finnish language studies in order to integrate with Finnish society

¹) Depending on the selected option and optional studies
WCE–RAN Schedule — 1st Year

Autumn 2017
Periods 1-2

- Introduction to Optimization (5 cr, 1 p)
- Communications Networks I (5 cr, 2 p)
- Statistical Signal Processing (5 cr, 1 p)
- Elements of Information Theory and Coding (5 cr, 2 p)
- Broadband Communications Systems (5 cr, 1 p)
- Wireless Communications I (5 cr, 2 p)

Spring 2018
Periods 3-4

- Wireless Communications II (8 cr, 3-4 p)
- Communications Networks II (7 cr, 3-4 p)
- Commun. Signal Processing I (5 cr, 3 p)
- Mobile Telecommunication Systems (5 cr, 3 p)
- Commun. Signal Processing II (5 cr, 4 p)
- Advanced Practical Training (3 cr)
  (recommended in summer 2018, training report will be done on autumn 2018 term)

Finnish Language studies (2-5 cr) and/or optional studies depending on personal workload

Basic Studies

Advanced Studies

Optional Studies
WCE–RAN Schedule — 2nd Year

Autumn 2018
Periods 1-2

- Optional Course
- Radio Engineering I (5 cr, 2 p)
- Optional Course
- Optional Course

Spring 2019
Periods 3-4

- Diploma (M.Sc.) Thesis Work (30 cr, 2-4 p)
- Finnish Language studies (2-5 cr) and/or optional studies to fulfil 120 ECTS requirement
# WCE–RF Schedule — 1st Year

## Autumn 2017

<table>
<thead>
<tr>
<th>Periods 1-2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electronics Design II</strong> (6 cr, 1 p)</td>
</tr>
<tr>
<td><strong>Electronics Design III</strong> (5 cr, 2 p)</td>
</tr>
<tr>
<td><strong>Commun. Signal Processing I</strong> (5 cr, 3 p)</td>
</tr>
<tr>
<td><strong>Statistical Signal Processing</strong> (5 cr, 1 p)</td>
</tr>
<tr>
<td><strong>Radio Engineering I</strong> (5 cr, 2 p)</td>
</tr>
<tr>
<td><strong>Broadband Communications Systems</strong> (5 cr, 1 p)</td>
</tr>
<tr>
<td><strong>Wireless Communications I</strong> (5 cr, 2 p)</td>
</tr>
<tr>
<td><strong>Radio Engineering II</strong> (6 cr, 3 p)</td>
</tr>
<tr>
<td><strong>Radio Channels</strong> (5 cr, 4 p) or <strong>Antennas</strong> (5 cr, 4 p)</td>
</tr>
<tr>
<td>(one of these is mandatory, one can be chosen as an optional study course)</td>
</tr>
<tr>
<td><strong>Optional Course</strong></td>
</tr>
</tbody>
</table>

## Spring 2018

<table>
<thead>
<tr>
<th>Periods 3-4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RF Components and Measurements</strong> (5 cr, 4 p)</td>
</tr>
<tr>
<td><strong>Commun. Signal Processing I</strong> (5 cr, 3 p)</td>
</tr>
<tr>
<td><strong>Radio Engineering II</strong> (6 cr, 3 p)</td>
</tr>
<tr>
<td><strong>Radio Channels</strong> (5 cr, 4 p) or <strong>Antennas</strong> (5 cr, 4 p)</td>
</tr>
<tr>
<td>(one of these is mandatory, one can be chosen as an optional study course)</td>
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<tr>
<td><strong>Optional Course</strong></td>
</tr>
</tbody>
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**Finnish Language studies (2-5 cr) and/or optional studies depending on personal workload**
WCE–RF Schedule — 2nd Year

Autumn 2018
Periods 1-2
- Electronic System Design (5 cr, 1 p)
- Communications Circuit Design (5 cr, 1 p)
- Optional Course
- Optional Course
- Telecommunication Engineering Project (5 cr)
  or
  Electronics Design and Construction Exercise (5 cr, 1-2 p)
  (either one of these is mandatory)
- Finnish Language studies (2-5 cr) and/or optional studies to fulfill 120 ECTS requirements

Spring 2019
Periods 3-4
- Diploma (M.Sc.) Thesis Work (30 cr, 2-4 p)
- Optional Course
- Optional Course

Basic Studies
Advanced Studies
Optional Studies