Master’s Degree Programme
Computer Science

Revised 7 April 2017
Master’s Degree Programme

- Important choices
- Structure of the Master’s Degree Programme
- Specialization columns
- Elective courses / ”tilvalg”
- Requirements for the study programme
- Admission
- Practical information

- Slides: www.cs.au.dk/studieorientering
Choices

During Master’s degree studies:
- Specialization?
- Elective courses?
- Study abroad?
- ph.d.?
Master’s Degree Programme

- Important choices
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Structure of Master’s Programme: Ex 1

- **Specialization:**
  - Two full 30 ECTS specializations (spec 1 & spec 2)

- **Elective:**
  - Remaining mandatory courses not included in bachelor program,
  - (Part of) a 3rd 30 ECTS specialization,
  - Elective cs-courses (see later)
  - (Part of) a coherent 30 ECTS supplementary subject ("tilvalg") such as math, multimedia (Arts), economy (BSS), technology (ASE/ENG), ideally supporting specialisations

- **Thesis:**
  - Written within the area of spec 1 or spec 2
Structure of Master’s Programme: Ex 1

- Variations of example 1

<table>
<thead>
<tr>
<th>Semester</th>
<th>Spec 1a</th>
<th>Spec 2a</th>
<th>Tilvalg (Math: Algebra)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Spec 1a</td>
<td>Spec 2a</td>
<td>Spec 2: Project work</td>
</tr>
<tr>
<td>2.</td>
<td>Spec 1b</td>
<td>Spec 2b</td>
<td>Spec 2: Project work</td>
</tr>
<tr>
<td>3.</td>
<td>Spec 1c</td>
<td>Spec 2c</td>
<td>Spec 2: Project work</td>
</tr>
<tr>
<td>4.</td>
<td>Thesis</td>
<td></td>
<td>Thesis (within Spec 2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester</th>
<th>Spec 1a</th>
<th>Spec 2a</th>
<th>Spec 3a</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Spec 1a</td>
<td>Spec 2a</td>
<td>Spec 3a</td>
</tr>
<tr>
<td>2.</td>
<td>Spec 1b</td>
<td>Spec 2b</td>
<td>Spec 3b</td>
</tr>
<tr>
<td>3.</td>
<td>Spec 1c</td>
<td>Spec 2c</td>
<td>Elective CS</td>
</tr>
<tr>
<td>4.</td>
<td>Thesis</td>
<td></td>
<td>Thesis (within Spec 2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester</th>
<th>Spec 1a</th>
<th>Spec 2a</th>
<th>Tilvalg (technology)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Spec 1a</td>
<td>Spec 2a</td>
<td>Tilvalg (technology)</td>
</tr>
<tr>
<td>2.</td>
<td>Spec 1b</td>
<td>Spec 2b</td>
<td>Tilvalg (technology)</td>
</tr>
<tr>
<td>3.</td>
<td>Spec 1c</td>
<td>Spec 2c</td>
<td>Tilvalg (technology)</td>
</tr>
<tr>
<td>4.</td>
<td>Thesis</td>
<td></td>
<td>Thesis (within Spec 2)</td>
</tr>
</tbody>
</table>
Structure of Master’s Programme: Ex 2
Including study abroad

- Specialization:
  - A single 30 ECTS specialization (spec 1)

- Elective:
  - Remaining mandatory courses not included in bachelor program,
  - (part of) a 2nd 30 ECTS specialization,
  - Elective cs-courses (see later)
  - (part of ) a coherent 30 ECTS supplementary subject (“tilvalg”) such as math, multimedia (Arts), economy (BSS), technology (ASE/ENG), ideally supporting specialisations

- Thesis:
  - Written within the area of spec 1

- NB: Elective + study abroad must contain 30 ECTS master level CS
### Structure of Master’s Programme: Ex 2
Including study abroad

#### Variations of example 2

<table>
<thead>
<tr>
<th>1. semester</th>
<th>Spec 1a</th>
<th>Spec 2a</th>
<th>Tilvalg (Math: Algebra)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. semester</td>
<td>Spec 1b</td>
<td>Spec 2b</td>
<td>Mandatory (Optimization)</td>
</tr>
<tr>
<td>3. semester</td>
<td></td>
<td></td>
<td>Study abroad (with 20 ECTS master level CS &amp; credit transfer for Spec 1c)</td>
</tr>
<tr>
<td>4. semester</td>
<td></td>
<td></td>
<td>Thesis (within Spec 1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1. semester</th>
<th>Spec 1a</th>
<th>Spec 2a</th>
<th>Spec 3a</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. semester</td>
<td>Spec 1b</td>
<td>Spec 2b</td>
<td>Spec 3b</td>
</tr>
<tr>
<td>3. semester</td>
<td></td>
<td></td>
<td>Study abroad (with credit transfer for Spec 1c)</td>
</tr>
<tr>
<td>4. semester</td>
<td></td>
<td></td>
<td>Thesis (within Spec 1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1. semester</th>
<th>Spec 1a</th>
<th>Spec 1c</th>
<th>Tilvalg (Economy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. semester</td>
<td>Spec 1b</td>
<td></td>
<td>Tilvalg (Economy)</td>
</tr>
<tr>
<td>3. semester</td>
<td></td>
<td></td>
<td>Study abroad (All 30 ECTS are master level CS)</td>
</tr>
<tr>
<td>4. semester</td>
<td></td>
<td></td>
<td>Thesis (within Spec 1)</td>
</tr>
</tbody>
</table>
Master’s Degree Programme

- Important choices
- Structure of the Master’s Degree Programme
- Specialization columns
- Elective courses / ”tilvalg”
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- Admission
- Practical information
What is a specialization column?

- 30 ECTS courses within a subdiscipline of computer science
- Gives the minimal basis for writing a thesis

- Flexibility:
  - Up to 10 ECTS of the 30 ECTS may be replaced by a course from another specialization or a project work

- The following slides have current offerings
  - Depends on current research groups

- You choose based on
  - Interest
  - Career dreams
Current specializations

- Cryptology
- Algorithmics
- Programming Languages
- Human-Computer Interaction (HCI)
- Ubiquitous Computing and Interaction (UBI)
- Bioinformatics

Contacts
- Ivan Damgaard
- Gerth Brodal
- Anders Møller
- Susanne Bødker
- Kaj Grønbæk
- Christian Storm
# Cryptology

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st sem (Fall)</td>
<td>Cryptology</td>
</tr>
<tr>
<td>2nd sem (Spring)</td>
<td>Cryptologic Protocol Theory</td>
</tr>
<tr>
<td>3rd sem (Fall)</td>
<td>Cryptographic Computing</td>
</tr>
</tbody>
</table>

**Note**

- 1st semester is a prerequisite for 2nd and 3rd semesters
- It is recommended to take course Algebra prior or concurrently
## Algorithmics

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st sem (Fall)</td>
<td>Computational Geometry: Theory and Experimentation</td>
</tr>
<tr>
<td>2nd sem (Spring)</td>
<td>Advanced Data Structures</td>
</tr>
<tr>
<td>3rd sem (Fall)</td>
<td>Theory of Algorithms and Computational Complexity</td>
</tr>
</tbody>
</table>

**Note**
- 1st semester is a prerequisite for 2nd semester
# Programming Languages

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st sem (Fall)</td>
<td>Program Analysis and Verification</td>
</tr>
<tr>
<td>2nd sem (Spring)</td>
<td>Language-based Security</td>
</tr>
<tr>
<td>3rd sem (Fall)</td>
<td>Functional Programming</td>
</tr>
</tbody>
</table>

**Note**
- Semesters are independent and can be taken in any order
# Human-Computer Interaction

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st sem (Fall)</td>
<td>Interactivity and Computer Mediation – Concepts, Theories, Methods, Cases</td>
</tr>
<tr>
<td>2nd sem (Spring)</td>
<td>Designing Interactive Technologies</td>
</tr>
<tr>
<td>3rd sem (Fall)</td>
<td>Multimodal Interaction</td>
</tr>
</tbody>
</table>

**Note**
- 1\textsuperscript{st} semester is a prerequisite for 2\textsuperscript{nd} semester and recommended for 3\textsuperscript{rd} semester
## Ubiqitous Computing and Interaction

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st sem (Fall)</td>
<td>Building the Internet of Things with P2P and Cloud Computing</td>
</tr>
</tbody>
</table>
| 2nd sem (Spring) | Q3: Augmented Reality (5 ECTS)  
Q4: Advanced Augmented Reality Project (5 ECTS) |
| 3rd sem (Fall) | Advanced Data Management and Analysis |

**Note**
- 3rd semester course is taught from fall 2018 only
- Semesters are independent and can be taken in any order
# Bioinformatics

(from MSc programme in Bioinformatics)

- **Specialization column Algorithms and Programming**
  
<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st sem (Fall)</td>
<td>Algorithms in Bioinformatics</td>
</tr>
<tr>
<td>2nd sem (Spring)</td>
<td>Genome-Scale Algorithms</td>
</tr>
<tr>
<td>3rd sem (Fall)</td>
<td>Advanced Programming in Bioinformatics</td>
</tr>
</tbody>
</table>

- **Specialization column Statistics and Data**
  
<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st sem (Fall)</td>
<td>Data Science in Bioinformatics</td>
</tr>
<tr>
<td>2nd sem (Spring)</td>
<td>Statistical and Machine Learning in Bioinformatics</td>
</tr>
<tr>
<td>3rd sem (Fall)</td>
<td>Statistical Methods in Bioinformatics OR Probabilistic Models for DNA sequencing Evolution</td>
</tr>
</tbody>
</table>

- **Specialization column Biology and Genomes**
  
<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st sem (Fall)</td>
<td>Tree of Life</td>
</tr>
<tr>
<td>2nd sem (Spring)</td>
<td>Population Genomics</td>
</tr>
<tr>
<td>3rd sem (Fall)</td>
<td>Advanced Topics in Genomics</td>
</tr>
</tbody>
</table>
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Elective Courses (CS)

- Elective courses
  - Select to support and strengthen your specialization

Elective courses (apart from specialisations) offered in CS:

- **Summer**
  - (31 July - 18 August 2017): Identity and Privacy (5 ECTS)

- **Fall**
  - Q1: Science-based IT Entrepreneurship and Innovation (5 ECTS)
  - Q2: Context Awareness (5 ECTS)
  - Machine Learning (10 ECTS)

- **Spring**:
  - Mathematics Education (5 ECTS)

- **Fall & Spring**:
  - Placement at Upper Secondary School (5 ECTS)
  - Project work in Computer Science (5 or 10 ECTS)
Elective courses (external)

Elective courses from outside CS:

- **30 ECTS “tilvalg”**
  - Examples from bachelor info-slides:
    - Mathematics
    - Technology (ASE)
    - Digital Design and Information Studies (Arts)
    - Economy (BSS)
    - IT-product Development
  - Example specifically for master level (see next slide):
    - Technology (ENG)

- **Single courses**
  - Part(s) of a 30 ECTS “tilvalg”
Elective courses (ENG)  

ENG-“tilvalg”, 30 ECTS from:

- **Fall**
  - Optimization and Data Analytics (10 ECTS)
  - Internet of Things (10 ECTS)
  - Modelling of Critical Systems (5 ECTS)
  - Embedded Real Time Systems (10 ECTS)

- **Spring**
  - System Engineering (5 ECTS)
  - Wireless Sensor Networks (5 ECTS)
  - Computer Vision and Machine Learning (10 ECTS)
  - Distributed and pervasive systems (10 ECTS)
  - Modelling and verification (10 ECTS)
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Requirements for the Study Programme

- 120 ECTS in total
  - At least 90 ECTS graduate level computer science
  - At least 180 ECTS computer science in bachelor + master’s
- Mandatory courses:
  - Mandatory courses is determined at admission (usually courses missing in bachelor program)
- Specialization columns
  - At least 2 specialization columns of 30 ECTS each
  - A single specialization column suffices when the programme includes study abroad
- Thesis (30 ECTS)
Yellow Brick Requirement

- All Programmes (Bachelor or Master’s) must include 60 ECTS passed at Science and Technology, Aarhus University

- This has implications for credit transfer!
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Admission

- When bachelor completed
- You apply for admission into Master’s Programme
- ... or apply for admission into PhD studies
- Admission
  - You must actively apply for admission
  - You must actively apply for SU
  - Making a study programme (contract) does not suffice
- http://kandidat.au.dk/optagelse/adgangskrav/
Temporary Admission

- If you lack $X<30$ ECTS in your bachelor, you may for a 6 months period take $30-X$ ECTS courses to be part of your future Master’s Programme.
- No temporary admission if you still lack a mandatory course and you have failed it twice!
- Never delay (re)examination in a mandatory course!
- This might have SU-related consequences!
PhD studies?

- Apply for PhD studies!
  - For deadlines see http://talent.au.dk/phd/scienceandtechnology/opencalls/
  - You receive a salary while studying!
  - http://talent.au.dk/phd/scienceandtechnology/programmes/computer-science/
  - Contact Anders Møller for info http://pure.au.dk/portal/en/amoeller@cs.au.dk
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**Practical information**

- Contracts
- Signing up for courses
- Study abroad
- ”Fremdriftsreform”
- Student Guidance
Contracts

- **http://kontrakt.scitech.au.dk/**
- **Master’s Contract:**
  - Complete before signing up for first course in Master’s Programme
    - Also in case of temporary admission
    - You may only sign up for courses mentioned in your contract
  - Revise at semiannual interviews in April and October
- **Thesis Contract:**
  - Sign at start of thesis work

NB: Revised contract templates available from 4 April, 2017
Signing up for courses

- **Sign up:**
  - December 1 – March 15 for courses in Summer
  - May 1-7 for courses in (Summer & Fall)
  - November 1-7 for courses in the Spring

- **Schedule for elective courses:**
  - watch out for collisions!
Stay abroad

- General information (destinations, deadlines, procedures, etc)

- Credit transfer
  - Advance approval (ECTS computation may be tricky!)
  - If foreign university allows less than 30 ECTS then top up with
    - Summer courses
    - Project work
  - Update Master’s contract / book an interview
  - Contact Gudmund

- Questions?
  - Contact Arne Nis Jensen, Ada 120, ajensen@cs.au.dk
Fremdriftsreform ("study progress reform")

- If you follow the recommended program of study (30 ECTS per semester) and take courses in the correct order (the Box Diagrams) you need not worry about the study progress reform.
- If you fall behind or do not pass a course at the latest by the first reexamination then contact us for advice and guidance on your individual study program.
- If you ignore this advice and believe that "it will be fine", it may have serious consequences!
  - If you do not pass minimum 45 ECTS per year or you do not complete your master’s program within six months after the prescribed time you are automatically signed out of the study program / out of the university.
    
Student Counselor

- The student counselor may help you
  - Magnus Høholt Kaspersen

  - Possible topics:
    - Change of study programme, delay, leave of absence, withdrawal
    - Illness
    - Study regulations, selecting supplementary subjects
Information Meetings

Thursday 30 March 2017 (Store Aud, 5510-103):

- 14-15: IT-Product Development: Master’s Program
- 15-16: IT: Bachelor Program
- 16-17: Computer Science & IT: Master’s Thesis

Friday 31 March 2017 (PBA Aud, 5335-016):

- 14-15: Computer Science: Bachelor Program
- 15-16: Computer Science: Master’s Program
Du kan få indflydelse!

- Kom med i et udvalg
  - Henvend dig til formanden
  - Du kan finde nuværende studentermedlemmer på webben
- Uddannelsesudvalg
  - Formand: Gerth Stølting Brodal, gerth@cs.au.dk
  - http://cs.staff.au.dk/boards-and-committees/education-committee/
- Lokaleudvalg
  - Formand: Annemette Hammer, ahammer@cs.au.dk
  - http://cs.staff.au.dk/boards-and-committees/office-committee/
- PR-udvalg
  - Søren Poulsen, poulsen@cs.au.dk
  - http://cs.staff.au.dk/boards-and-committees/pr-committee/