Information Session for CEG2 Students
- Major Requirements
- Technical Electives
- Industrial Attachment
- Three pathways (for AY16 Poly intake)

9 March 2017, 4pm @ LT1

A/Prof Bharadwaj Veeravalli elebv@nus.edu.sg
CEG2 & CEG3 Coordinator
Joint Academic Committee (JAC)
Department of Electrical & Computer Engineering (ECE)

Three groups of students entering CEG3 in AY2017/18

- CEG1, AY2015/16 intake
- Common Engrg ENG1, AY2015/16 intake
  (streamed to CEG2 in AY2016/17)
- CEG2 Poly, AY2016/17 intake
B.Eng. (CEG) Curriculum Structure

AY2015/16 intake

University Level Requirements (ULR)

One General Education Module (GEM) from each of the five pillars:
- Human Cultures
- Asking Questions
- Quantitative Reasoning
- Singapore Studies
- Thinking and Expression

Total (minimum) MCs for graduation = 160

CEG Programme / Major Requirements

- Faculty reqs: CS2101, EG2401 & HR2002 - 10 MCs
- Level 1000 Mathematics, Science & Technology - 30 MCs
- Other core modules - 38 MCs
- CEG project modules - 22 MCs
- Industrial Attachment (6-months) - 12 MCs
- CEG Technical Electives - 12 MCs

Unrestricted Elective Modules (UEM)

Offered by Any Faculty/School

16 MCs

Total MCs=12 (7.45%)

Unrestricted Elective Modules

- Including ES1103 (if not exempted)#

16 MCs

CEG Modular Requirements and Credits

AY2015/16 intake

<table>
<thead>
<tr>
<th>Modular Requirements</th>
<th>MCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIVERSITY LEVEL REQUIREMENTS</td>
<td>20</td>
</tr>
</tbody>
</table>
| 1 x General Education Module (GEM) from each of:
- Human Cultures: GER1xxx
- Asking Questions: HC/SS/T&E
- Quantitative Reasoning: GER1000
- Singapore Studies: GES1xxx
- Thinking and Expression: GET1021 Critical Thinking & Writing | 5 x 4 |
| UNRESTRICTED ELECTIVE MODULES |
| Including ES1103 (if not exempted)# | 16 |
| PROGRAMME REQUIREMENTS | 124 |
| Faculty Requirements | 10 |
| - CS2101 Effective Comm for Computing Professionals | 4 |
| - EG2401 Engineering Professionalism | 3 |
| - HE2022 Human Capital in Organizations | 3 |
| CEG Core Modules | 68 |
| - CG1001 Introduction to Computer Engineering | 2 |
| - CG1106 Electrical Engineering | 4 |
| - CG2123 Signals & Systems | 4 |
| - CG2271 Real-time Operating Systems | 4 |
| - CG3207 Computer Architecture | 4 |
| CEG Project Modules | 22 |
| - CG3602 Embedded Systems Design Project | 6 |
| - EE301 Innovation & Enterprise I | 4 |
| - CG4101 B.Eng. Dissertation (over 2 semesters) | 12 |
| CEG Technical Electives | 12 |
| TOTAL | 160 |

# For students who have not passed or been exempted from the Qualifying English Test at the point of admission.

http://ceg.nus.edu.sg/curriculum/ProgReqAY14.html

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# B.Eng. (CEG) Curriculum Structure

## AY2016/17 intake

<table>
<thead>
<tr>
<th>University Level Requirements (ULR)</th>
<th>CEG Programme / Major Requirements</th>
<th>Unrestricted Elective Modules (UEM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>One General Education Module (GEM) from each of the five pillars:</td>
<td>Faculty reqs: CS2101, EG2401 &amp; ES1531 - 11 MCs</td>
<td>16 MCs Offered by Any Faculty/School</td>
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<tr>
<td>- Human Cultures</td>
<td>Level 1000 Mathematics, Science &amp; Technology - 30 MCs</td>
<td></td>
</tr>
<tr>
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<tr>
<td>- Thinking and Expression</td>
<td>CEG Technical Electives - 12 MCs</td>
<td></td>
</tr>
<tr>
<td>20 MCs</td>
<td>Total MCs=125</td>
<td>16 MCs</td>
</tr>
</tbody>
</table>

**Total (minimum) MCs for graduation = 161**

Refer to the respective File For Graduation (FFG) document at http://www.ceg.nus.edu.sg/students/FFG_Checklists.html

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## CEG Modular Requirements and Credits

### AY2016/17 (Poly) intake

<table>
<thead>
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<td>1 x General Education Module (GEM) from each of:</td>
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<td>- Asking Questions: GEQ1000</td>
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</tr>
<tr>
<td><strong>PROGRAMME REQUIREMENTS</strong></td>
<td>125</td>
</tr>
</tbody>
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- **Faculty Requirements**
  - CS2101 Effective Comm (exempted) | 4 |
  - EG2401 Engineering Professionalism | 3 |
  - ES1531 Critical Thinking & Writing | 4 |
  - CEG Core Modules | 68 |
  - CG1001 Introduction to Computer Engineering | 2 |
  - CG1106 Electrical Engineering | 4 |
  - CG2223 Signals & Systems | 4 |
  - CG2271 Real-time Operating Systems | 4 |
  - CG3207 Computer Architecture | 4 |

- **CEG Project Modules**
  - MA1505 Mathematics I | 4 |
  - MA1506 Mathematics II | 4 |
  - MA1507 Engineering Mathematics | 4 |
  - EE2020 Digital Fundamentals | 5 |
  - EE2021 Devices & Circuits | 4 |
  - EE2024 Programming for Computer Interfaces | 5 |
  - EE3324 Computer Communication Networks I | 4 |
  - MA3101 Linear Algebra | 4 |
  - MA3197 Stochastic Processes | 4 |
  - EE3324 Computer Communication Networks I | 4 |
  - CEG Project Modules | 22 |
  - CEG Technical Electives (over 2 semesters) | 12 |

**TOTAL** 161

# For students who have not passed or been exempted from the Qualifying English Test at the point of admission.

http://www.ceg.nus.edu.sg/curriculum/requirements.html

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CEG Curriculum

- **Year 1 & 2:**
  Wide coverage of Math, Engineering, Computing and Scientific fundamentals

- **Year 3 & 4:**
  Specialized courses that track the latest technology developments in the field

- Enable CEG graduates to deal with computer engineering problems of today and face future challenges

Points to Consider

- Core modules / Major requirements
- Choice of Technical Electives in Year 3 & 4 (some choose to start in year 2)
- IA semester
- Recommended study schedules
Core modules / Major requirements

- Core Modules*
  - CG3002 Embedded Systems Design Project
  - CG3207 Computer Architecture
  - CG4001 B.Eng. Dissertation
  - EE3031 Innovation & Enterprise I
  - EE3204 Computer Communications Networks I
  - EG2401 Engineering Professionalism
  - HR2002 Human Capital in Organizations (for AY15 intake & prior)
  - Industrial Attachment

+ (at least) 12 MCs of Technical Elective modules to achieve Breadth and Depth within B.Eng. (CEG)

*This is in addition to other modules that are usually taken in the lower years.

Points to Consider

- Core modules / Major requirements
- Choice of Technical Electives in Year 3 & 4 (some choose to start in year 2)
- IA semester
- Recommended study schedules
Technical Electives - Organization

- The technical electives (TE) are organized into six different concentrations. Each concentration contains some breadth & depth modules.
- Breadth modules: Core to the area and provides broad understanding of concepts
- Depth modules: More specialized and provides greater depth & coverage
- Other modules hosted by CS or ECE may also be used as fulfilling CEG TE requirements. Generally, a level 3000 module will count as TE Breadth, while a level 4000 will count as TE Depth.
- CEG students CANNOT exercise S/U option on ALL higher-level modules hosted by FoE and SoC (because all have pre-requisites).
- More than 50 modules (offered by CS/ECE) are available!
- Only THREE TEs (equivalent to 12 MCs) need to be taken over 2 - 4 semesters.

Technical Electives - Organisation

There are/may be changes to the technical electives (from last year):
- Change in semester in which a module is offered
  [Most TEs are offered once a year.]
- Changes to pre-requisites
- Changes in title, module code and syllabus
- New module / Module no longer offered

Useful links:
2. Updated master-list of technical electives (within the six concentrations) http://www.ceg.nus.edu.sg/students/third_year.html (under ‘Academic Information/Useful Links’)
3. CEG Technical Elective page http://www.ceg.nus.edu.sg/students/ceg3TE/

For above links #2 & #3, please check for updated version in May 2017.
Technical Electives - Requirements

(a) Depth (D) requirement
At least TWO Depth technical electives

(b) Modular credits requirement
At least 12 MCs of technical electives

Modules can come from Any/None of the concentrations!

Technical Electives - Concentrations

The CEG concentrations are:

- Communications & Networking
- Embedded Computing
- Large-Scale Computing
- Intelligent Systems
- Interactive Digital Media
- System-on-a-Chip Design

http://www.ceg.nus.edu.sg/curriculum/electives.html
CEG concentration

Communications & Networking
CS2010 Data Structures & Algorithms II
CS2107 Introduction to Information Security
CS3103 Computer Networks Practice
CS3230 Design & Analysis of Algorithms
CS3235 Computer Security
EE3131C Communication Systems
CS4222 Wireless Networking
CS4226 Internet Architecture
CS4236 Cryptography Theory & Practice
CS4238 Computer Security & Practice
EE4113 Digital Communications & Coding
EE4114 Optical Communications
EE4210 Computer Communication Networks II

Long pre-requisite chain e.g. CS4238 (only offered in sem 2)
CS4238’s pre-req: CS3235; CS3235’s pre-req: EE3204, CG2271 and CS2107
CS2107 & EE3204 (sem 5) -> IA (sem 6) -> CS3235 (sem 7) -> CS4238 (sem 8)

If very keen to read CS4238, need to read ‘extra’ TE Breadth (which can be declared as UEM)

Embedded Computing
CS2010 Data Structures & Algorithms II
CS2104 Programming Language Concepts
CS2107 Introduction to Information Security
CS2108 Introduction to Media Computing
CS3103 Computer Networks Practice
CS3218 Multimodal Processing in Mobile Platforms
CS3235 Computer Security
EE3206 Introduction to Computer Vision & Image Processing
CS4212 Compiler Design
CS4222 Wireless Networking
CS4236 Cryptography Theory & Practice
CS4238 Computer Security Practice
EE4210 Computer Communication Networks II
EE4214 Real-time Embedded Systems
EE4218 Embedded Hardware Systems Design
EE4415 Integrated Digital Design

EE4214 may likely NOT be offered in AY17/18.

If flexible with choice of TE, EE3204 (sem 5) -> IA (sem 6) -> CS3103 (sem 7) -> CS4222 (sem 8)
IA (sem 5) -> EE3204 (sem 6) -> CS3103 (sem 7) -> EE4210 (sem 8)
CEG concentration

Large-Scale Computing
CS2010 Data Structures & Algorithms II
CS2102 Database Systems
CS2104 Programming Language Concepts
CS2107 Introduction to Information Security
CS3210 Parallel Computing
CS3211 Parallel and Concurrent Programming
CS3230 Design & Analysis of Algorithms
CS3235 Computer Security
CS3223 Database Systems Implementation
CS4211 Formal Methods for Software Engineering
CS4212 Compiler Design
CS4221 Database Applications Design and Tuning
CS4223 Multi-Core Architectures
CS4224 Distributed Databases
CS4231 Parallel & Distributed Algorithms
CS4345 General-Purpose Computation on GPU
EE4210 Computer Communication Networks II

Do NOT choose a TE just based on its module title solely! Cannot exercise S/U option.

The Need to Plan

Large-Scale Computing
CS2010 Data Structures & Algorithms II
CS2102 Database Systems
CS3223 Database Systems Implementation
CS4221 Database Applications Design and Tuning
CS4224 Distributed Databases

Pre-req of CS4221/CS4224: CS3223 (only offered in sem 2)
Pre-req of CS3223: CS2010 AND CS2102

CS2010 & CS2102 (sem 3/4) -> IA (sem 5) -> CS3223 (sem 6)
-> CS4224 (sem 7) / CS4221 (sem 8)

CS2010 is offered in upcoming Special Term (ST2). Extra TEs may be declared as UEM.

Need to start reading TE Breadths in Year 2.
CEG concentration

**Intelligent Systems**
- CS2010 Data Structures & Algorithms II
- CS3240 Interaction Design
- CS3243 Introduction to Artificial Intelligence
- CS3244 Machine Learning
- EE3206 Introduction to Computer Vision and Image Processing
- EE3331C Feedback Control Systems
- EE3731C Signal Processing Methods
- CS4244 Knowledge-based Systems
- CS4246 AI Planning and Decision Making
- CS4248 Natural Language Processing
- EE4212 Computer Vision
- EE4213 Image & Video Processing <not offered in AY17>
- EE4305 Introduction to Fuzzy/Neural Systems
- EE4306 Distributed Autonomous Robotic Systems
- EE4307 Control Systems Design and Simulation

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The Need to Plan

**Intelligent Systems**
- CS2010 Data Structures & Algorithms II
- CS3243 Introduction to Artificial Intelligence
- CS4244 Knowledge-based Systems
- CS4246 AI Planning and Decision Making
- CS4248 Natural Language Processing

**Pre-req of CS4244:** CS3243 (only offered in sem 2)

**Pre-req of CS4246/CS4248:** CS3243 (only offered in sem 2) AND ST2334

**Pre-req of CS3243:** CS2010 AND CS1231

CS1020, CS1231 & ST2334 (Year 2) -> CS2010 (Special Term) -> IA (sem 5)
-> CS3243 (sem 6) -> CS4246/8 (sem 7) OR CS4244 (sem 8)

*Need to take CS2010 in Special Term, and IA sem affected*
**CEG concentration**

**Interactive Digital Media**
- CS2108 Introduction to Media Computing
- CS3240 Interaction Design
- CS3241 Computer Graphics
- CS3242 3D Modeling and Animation
- CS3247 Game Development
- CS3249 User Interface Development
- EE3206 Introduction to Computer Vision and Image Processing
- EE3331C Feedback Control Systems
- EE3731C Signal Processing Methods
- EE3701 Digital Media Technologies
- CS4243 Computer Vision and Pattern Recognition
- CS4247 Graphics Rendering Techniques
- CS4249 Phenomena and Theories of Human-Computer Interaction
- CS4347 Sound and Music Computing
- EE4212 Computer Vision
- EE4213 Image & Video Processing <not offered in AY17>
- EE4604 Biological Perception in Digital Media
- ME4245 Robot Kinematics, Dynamics and Control

**System-on-a-Chip Design**
- EE3407 Analog Electronics
- EE3408C Integrated Analog Design
- CS4223 Multi-Core Architectures
- EE4214 Real-time Embedded Systems
- EE4216 Embedded Hardware Systems Design
- EE4415 Integrated Digital Design

The pre-requisite(s) of all modules within this concentration are CEG core modules.

- CG2271 (sem 4) -> CG3207 (sem 5) -> CS4223 (sem 7)
- EE2020 -> EE4218 (sem 5/7) OR EE4415 (sem 6/8)

EE4214 may likely NOT be offered in AY17/18.
Technical Electives - Advices

- Be flexible in your choice of technical electives
- Take more technical electives, and declare the ‘extra’ as UEM (16 MCs)
- Plan / look-ahead!!
- Interest vs Ability [Cannot exercise S/U option]
- Participate in the Module Preference Exercise (MPE) to indicate your interest in the TEs hosted by SoC. MPE is carried out in early-July (for sem 1), and early-Dec (for sem 2).
- CS2010 will be offered in upcoming ST2. Online registration (via STRS) starts end-May.
- Not necessary to read all three TEs from same/any concentration.

Points to Consider

- Core modules / Major requirements
- Choice of Technical Electives in Year 3 & 4 (some choose to start in year 2)
- IA semester
- Recommended study schedules
IA semester

- NOT allowed to do two rounds of 3-months internships, in lieu of (compulsory) 6-months IA (CP3880/EG3611).
- For AY17/18,
  - CG3002 may be offered in both semesters, ONLY IF a minimum enrolment of 18 students is met.
  - CG3207 will be offered as an evening module in sem 1 (only). Its lecture and one lab session will be scheduled at 6pm.
- May take (up to) TWO evening modules during IA, subject to the approval of the company and module availability, consisting of:
  - Core modules e.g. CG3207 (sem 1), EE3031, EG2401
  - Technical Electives:
    - Sem 1: CS3216, CS4211/2, CS4236, CS4343/6/9, EE3731C, EE4218
    - Sem 2: CS4221, CS4231/8, CS4242, EE4212
  - Modules offered by other Fac/Sch e.g. GEK1505

Note: BTech modules e.g. EExxxxE NOT available to BEng students on IA.

http://www.ceg.nus.edu.sg/ia/

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IA semester

- Online application, Round 2
  - FoE IA (Jul-Dec 2017)) / VIP (May-Jul 2017): 24 Mar - 3 Apr
  - SoC ATAP (May-Oct 2017) / SIP (May-Jul 2017): 30 Mar - 2 Apr

Do NOT apply from both portals.

Refer to Dr Rajesh’s slides from IA briefing in August 2016, CEG IA page, and also look out for the emails from FoE and SoC administrators.

- Self-sourced IA (or internship)
  - Either apply to convert to EG3611/EG3612 via FoE,
  - or CP3880/CP3200 via SoC, latest by 30 Apr.

- IA/internship is on ‘Completed Satisfactorily / Completed Unsatisfactorily’ (CS/CU) basis.

http://www.ceg.nus.edu.sg/ia/
Points to Consider

- Core modules / Major requirements
- Choice of Technical Electives in Year 3 & 4 (some choose to start in year 2)
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Points to Consider

- Core modules / Major requirements
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- Recommended study schedules

Recommended Study Schedules

- ULR/GEM and UEM requirements are reflected randomly. Remember to read/clear these modules.
- Workload per semester: Minimum 18 MCs, and up to 25 MCs (if CAP > 2.0) up to 20 MCs (if CAP < 2.0)

- Project Modules:
  - Be careful about taking CG3002/EE3031 together with FYP (CG4001 B.Eng. Dissertation) in semester 7 (e.g. due to SEP/IA).
    - Workload is very heavy!
    - If unable to avoid (e.g. cannot find suitable module during SEP), students should still keep to the average workload of 20 MCs [i.e. CG3002, CG4001 and two other modules].
    - Read EE3031 during IA, or find equivalent module during SEP
  - Pay attention to workload balancing!

http://www.ceg.nus.edu.sg/students/studyschedule.html
Recommended Study Schedules
AY2015/16 direct intake

<table>
<thead>
<tr>
<th>Sem 4</th>
<th>Sem 5</th>
<th>Sem 6</th>
<th>Sem 7</th>
<th>Sem 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG2271 Real-Time Operating Systems</td>
<td>or EG3611 IA</td>
<td>EE3031 Innovation &amp; Enterprise I</td>
<td>HR2002 Human Capital in Organizations</td>
<td>Depth Elective</td>
</tr>
<tr>
<td>EE2024 Programming for Computer Interfaces</td>
<td>EE3204 Computer Comms Networks I</td>
<td>Breadth Elective</td>
<td>Depth Elective</td>
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<tr>
<td>ST2334 Probability &amp; Statistics</td>
<td>CG3207 Computer Architecture</td>
<td>UEM 1</td>
<td>UEM 2</td>
<td>UEM 4</td>
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<tr>
<td>GEH1xxx</td>
<td>EG2401 Engr Profm</td>
<td>GEG/GES/GET</td>
<td>UEM 3</td>
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<td>21 MCs</td>
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<td>22 MCs</td>
<td>21 MCs</td>
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</tr>
</tbody>
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**IMPORTANT:**
- Students are encouraged to use UEM space to take more technical electives.
- The minimum 12 MCs of electives satisfying CEG Breadth/Depth requirements can be taken in any semester upon satisfying the pre-requisites.
- The GE pillars and UEM can be taken in any semester.

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### Recommended Study Schedules

**AY2016/17 Poly intake**

(exempted from CG108)

<table>
<thead>
<tr>
<th>Sem 2</th>
<th>Sem 3</th>
<th>Sem 4</th>
<th>Sem 5</th>
<th>Sem 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES1531 Critical Thinking &amp; Writing</td>
<td>CS2103 Software Engrg</td>
<td>EE3204 Computer Comms Networks I</td>
<td>EQ2401 Engrg Profsm</td>
<td>Depth Elective</td>
</tr>
<tr>
<td>MA1505 Math I</td>
<td>MA1506 Math II</td>
<td>PC1432 Physics IIIE</td>
<td>Breadth Elective</td>
<td>Depth Elective</td>
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<tr>
<td>GEO1000 Fundamentals of Physics II</td>
<td>ST2334 Probability &amp; Statistics</td>
<td>GES1xxx</td>
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### Recommended Study Schedules

**AY2016/17 Poly intake**

(NOT exempted from CG108)

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<th>Sem 6</th>
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<tr>
<td>CS1231 Discrete Structures</td>
<td>EE2021 Devices &amp; Circuits</td>
<td>EE2024 Prog for Computer Interfaces</td>
<td>EE3204 Computer Comms Networks I</td>
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Three Differentiated Pathways
Tailored for You

Pathways differentiated by distinctive focus in:
- Internship
- FYP
- Pathway modules

Practising Professional Pathway (PPP)
Professional and versatile career in industry

Innovation & Design-Centric Pathway (iDCP)
Design & innovation, technopreneurship

Research-Focused Pathway (R/P)
B&D career, graduate studies

Common Year 1 Foundation

Internship FYP Pathway requirements

PPP
Technical work
CG4001
CS2103/T & EE3031

iDCP
Startups
Refer to iDCP site
http://www.eng.nus.edu.sg/edic/programme-requirements.html

R/P
Research institutions or lab
Research-based FYP
Graduate-level (i.e. CS/EE5xxx) technical elective x 2

If keen in:
- iDCP, will need to take a couple of design-related modules (as UEM).
- R/P, highly recommended to take CS2309 CS Research Methodology or EG2605
  Undergraduate Research Opportunities Programme (to help in decision-making).
ECE2 Streaming Talk - 10 March (Friday) @ LT6
CEG2 may join from 12.30pm.

ECE CAREER & INTERNSHIP FAIR 2017

- Network with industry personnel from various companies!
- Learn more about the jobs available for the different specialization areas!

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