**Briefing for CEG students (AY2016 intake)**
- Major Requirements
- Technical Electives
- Industrial Attachment
- Three Pathways

**6 April 2018, 12pm @ LT1**

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Joint Academic Committee (JAC)

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### BEng(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>
</tr>
<tr>
<td></td>
<td>Level 1000 Mathematics, Science &amp; Technology - 30 MCs</td>
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<td></td>
<td>Other core modules - 38 MCs</td>
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<td></td>
<td>CEG project modules - 22 MCs</td>
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<tr>
<td></td>
<td>Industrial Attachment (6-months) - 12 MCs</td>
<td></td>
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<tr>
<td></td>
<td>CEG Technical Electives - 12 MCs</td>
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</tr>
<tr>
<td>20 MCs</td>
<td>125 MCs</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](http://www.ceg.nus.edu.sg/students/FFG_Checklists.html)
This document appears to be the NUS (National University of Singapore) Modular Requirements and Credits outline for the CEG (Computer Engineering) program for the academic year 2016/17. The document is divided into two sections, one for direct intake and another for Poly intake. Each section lists the requirements in a table format, specifying the number of module credits (MCs) for each course and the total number of MCs required for graduation.

For students who have not passed or been exempted from the Qualifying English Test at the point of admission, specific courses are marked with a note. The total number of module credits for graduation is also provided for each intake type.
**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
- Three pathways for CEG AY16 intake
Core modules / Major requirements

- Core Modules*
  - CG3002 Embedded Systems Design Project
  - CG3207 Computer Architecture
  - CG4001 BEng Dissertation
  - EE3031 Innovation & Enterprise I
  - EE3204 Computer Communications Networks I
  - EG2401 Engineering Professionalism
  - Industrial Attachment

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

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

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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 - Organization

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](http://www.nus.edu.sg/Registrar/nusbulletin/modulesearch.html)
- 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](http://www.ceb.nus.edu.sg/Students/third_year.html) (within the six concentrations) under 'Academic Information/Useful Links'

For above links #2 & #3, please check for updated version in June 2018.
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!

The CEG concentrations are:

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

[Link to curriculum electives](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
EE3131 Communication Systems
CS4222 Wireless Networking
CS4226 Internet Architecture
CS4236 Cryptography Theory & Practice
CS4238 Computer Security & Practice
EE4210 Computer Communication Networks II

Note: EE4113 & EE4114 are no longer offered; check TE list in June.

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

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

CEG concentration

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
EE4218 Embedded Hardware Systems Design
EE4415 Integrated Digital Design

Note: EE4214 is no longer offered.

If flexible with choice of TE,
IA (sem 5) -> EE3204 (sem 6) -> EE4210 (sem 8)
EE3204 (sem 5) -> IA (sem 6) -> CS4222 (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
EE4210 Computer Communication Networks II

Note: CS4345 is not offered in AY17/18.

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)
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
EE4305 Introduction to Fuzzy/Neural Systems
EE4306 Distributed Autonomous Robotic Systems
EE4307 Control Systems Design and Simulation
Note: EE4213 is no longer offered

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 and CS2010 (Year 2) -> IA (sem 5) -> CS3243 (sem 6)
-> CS4246/8 (sem 7) OR CS4244 (sem 8)

Need to take CS2010 in Year 2, and do IA in Year 3, sem 1
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
- 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

Mutual preclusion for CS4243 and EE4212

CEG concentration

System-on-a-Chip Design
- EE3407 Analog Electronics
- EE3408C Integrated Analog Design
- CS4223 Multi-Core Architectures
- EE4218 Embedded Hardware Systems Design
- EE4415 Integrated Digital Design

Note: EE4214 is no longer offered.

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)
Technical Electives - Advices

- Be flexible in your choice of technical electives
- Take more technical electives, and declare the 'extra' as UEM (16 MCs)
- Plan and look ahead!
- Interest vs Ability [Cannot exercise S/U option]
- Participate in the Module Preference Exercise (MPE) to indicate your interest in the CS-coded TEs (hosted by SoC). MPE is carried out in early-July (for sem 1), and early-Dec (for sem 2).
- Not necessary to focus in a specific concentration i.e. not necessary to read all three TEs from the same concentration
- OK to read CS/EE 3/4xxx module(s) that are not listed within the six concentrations (and count as fulfilling TE requirements)

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
- Three pathways for CEG AY16 intake
IA semester

- Online application
  FoE IA (Jul-Dec 2018) / VIP (May-Jul 2018): ongoing until June
  SoC ATAP (May-Oct 2018) / SIP (May-Jul 2018): both rounds concluded
  *Do NOT apply from both portals.*

Refer to Dr Rajesh’s slides from IA briefing in August 2017, 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 20 Apr.

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

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

- PPP students are NOT allowed to do two rounds of 3-months internships,
  in lieu of (compulsory) 6-months IA (CP3880/EG3611).
- For AY18/19,
  - CG3002 will be offered in both semesters, with a cap on enrolment of 90 students per semester (due to lab constraints).
  - 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
  - Modules offered by other Fac/Sch e.g. GEH1036, GET1004

Some of your seniors did not take any module during IA.
BTech modules e.g. EExxxxE are NOT available to BEng students on IA.

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

- No difference per se between doing IA in sem 1 or sem 2
- Start the process Now (earlier rather than later)
- A handful of CEG seniors were unable to secure a IA placement until Week 1 (mid-January 2018)

- Students will be randomly assigned to CG3002 project groups.
- CG3002 will cease offer in AY19/20, as it will be replaced by CG4002 (8 MCs) – CEG capstone project for AY17 intake.
- Affected students (from AY16 intake) who were unable to bid for/secure CG3002 in sem 1, AY18/19, should (still) do IA in sem 2, AY18/19, then take CG4002 (8 MCs) in sem 1, AY19/20 (with FYP).

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
- Three pathways for CEG AY16 intake
Recommended Study Schedules

- ULR/GEM and UEM requirements are reflected randomly. Remember to read/clear these modules.
- Semestral workload: 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 BEng 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. CG4002, CG4001 and 1-2 regular 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

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<th>Sem 5</th>
<th>Sem 6</th>
<th>Sem 7</th>
<th>Sem 8</th>
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</thead>
<tbody>
<tr>
<td>CG2023 Signals</td>
<td>CG3002 Embedded Systems</td>
<td>CG4001 BEng Dissertation</td>
<td>CG4001 BEng Dissertation</td>
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<tr>
<td>&amp; Systems</td>
<td>Design Project</td>
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<tr>
<td>CG2271 OR</td>
<td>EE3031 Innovation &amp;</td>
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<tr>
<td>EE2027</td>
<td>Enterprise I</td>
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<td>EE2024 Programming</td>
<td>EE3204 Computer Comms</td>
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<tr>
<td>for Computer</td>
<td>Networks I</td>
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<tr>
<td>Interfaces</td>
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<tr>
<td>ST2334 Probability</td>
<td>CG3207 Computer</td>
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<tr>
<td>&amp; Statistics</td>
<td>Architecture</td>
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<td>GEH1xxx</td>
<td>EG2401 Engrg Profsm</td>
<td>GES1xxx</td>
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<tr>
<td></td>
<td>21 MCs</td>
<td>19 MCs</td>
<td>22 MCs</td>
<td>18 MCs</td>
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</tbody>
</table>

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.

Bid/Read EG2401 (3 MCs) in AY18/19

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Recommended Study Schedules
AY2016/17 Poly intake
(exempted from CG1108)

<table>
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<tr>
<th>Sem 4</th>
<th>Sem 5</th>
<th>Sem 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>CG2023 Signals &amp; Systems</td>
<td>CG4001 BEng Dissertation</td>
<td>CG4001 BEng Dissertation</td>
</tr>
<tr>
<td>CG3302 Embedded Systems Design Project</td>
<td>CG3207 Computer Architecture</td>
<td>EE3031 Innovation &amp; Enterprise I</td>
</tr>
<tr>
<td>EE3204 Computer Comm Networks I</td>
<td>EG2401 Engr Profm</td>
<td>Technical Elective Depth</td>
</tr>
<tr>
<td>PC1432 Physics IE</td>
<td>Technical Elective Breadth</td>
<td>Technical Elective Depth</td>
</tr>
<tr>
<td>ST2334 Probability &amp; Statistics</td>
<td>GEs1xxx</td>
<td>GET1xxx</td>
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**IMPORTANT:**
- Poly students are required to take MA1301 and PC1222 as compulsory Programme requirements.
- 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 can be taken in any semester.

Recommended Study Schedules
AY2016/17 Poly intake
(NOT exempted from CG1108)

<table>
<thead>
<tr>
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<th>Sem 5</th>
<th>Sem 6</th>
<th>Sem 7</th>
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</thead>
<tbody>
<tr>
<td>CG2023 Signals &amp; Systems</td>
<td>CG3302 Embedded Systems Design Project</td>
<td>CG4001 BEng Dissertation</td>
<td>CG4001 BEng Dissertation</td>
</tr>
<tr>
<td>CG2271 Real-Time Operating Syst</td>
<td>CG3207 Computer Architecture</td>
<td>EG2401 Engr Profm</td>
<td>Technical Elective Depth</td>
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<tr>
<td>EE3024 Prog for Computer Interfaces</td>
<td>EE3204 Computer Comm Networks I</td>
<td>EE3031 Innovation &amp; Enterprise I</td>
<td>Technical Elective Depth</td>
</tr>
<tr>
<td>PC1432 Physics IE</td>
<td>ST2334 Probability &amp; Statistics</td>
<td>Technical Elective Breadth</td>
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<tr>
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Points to Consider

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- Choice of Technical Electives in Year 3 & 4 (some choose to start in year 2)
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- Recommended study schedules
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Three Pathways for CEG AY16

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<th>Internship</th>
<th>FYP</th>
<th>Pathway requirements</th>
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<tr>
<td>PPP</td>
<td>6-months ATAP/IA</td>
<td>CG4001</td>
<td>CS2103/T &amp; EE3031</td>
</tr>
<tr>
<td>iDCP</td>
<td>3-months SIP/VIP</td>
<td>Refer to iDCP site</td>
<td><a href="http://www.eng.nus.edu.sg/edic/programme-iDCP2016.html">http://www.eng.nus.edu.sg/edic/programme-iDCP2016.html</a></td>
</tr>
<tr>
<td>RfP</td>
<td>SIP/VIP @ Research institutes or labs</td>
<td>CG4001 Research-based FYP</td>
<td>Technical electives</td>
</tr>
</tbody>
</table>

If keen in:
- iDCP, will need to take a couple of design-related modules (as UEM).
- RfP, highly recommended to take CS2309 CS Research Methodology or EG2605 Undergraduate Research Opportunities Programme (to help in decision-making).

Three Pathways for CEG AY16

If still undecided between PPP vs RIP...

- As PPP students are NOT allowed to take two rounds of 3-months internship, in lieu of 6-months (compulsory) IA, a direct implication is that affected students (i.e. switching back to PPP) are still expected to complete a 6-months IA.

- A reminder that Tuition Fee beyond Normal Candidature has taken effect from AY16 intake, so students are advised not to delay graduation beyond four years.

- Switching to RIP will not/unlikely delay graduation. The advisory is mainly intended for students who intend to switch (back) to PPP.

Decide on preferred pathway BEFORE going for IA/internship, else graduation may be delayed. Email Winnie if any change, so that the Student Information System (SIS) can be updated accordingly. For queries relating to iDCP, check with DCP office directly.


The FFG checklists are intended for (the bulk of) students in PPP. RIP and iDCP students should refer to the pathway mapping for CEG AY16 and use it to cross-check against the FFG checklist.

ECE2 Streaming Talk cum Career Fair
Ongoing NOW outside LT6 and E-Cubes