Briefing for CEG students (AY2017 intake)

- Major Requirements
- Technical Electives
- Industrial Attachment
- Three Pathways

21 February 2019, 11am @ LT4

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Dr Rajesh C Panicker eleraje@nus.eud.sg - CEG IA Coordinator

Joint Academic Committee (JAC)
# BEng(CEG) Curriculum Structure

## AY2017/18 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, EG2401A - 6 MCs</td>
<td>32 MCs Offered by Any Faculty/School</td>
</tr>
<tr>
<td>Human Cultures</td>
<td>Level 1000 Mathematics, Science &amp; Technology - 28 MCs</td>
<td></td>
</tr>
<tr>
<td>Asking Questions</td>
<td>Other core modules - 44 MCs</td>
<td></td>
</tr>
<tr>
<td>Quantitative Reasoning</td>
<td>Industrial Attachment (6-months) - 10 MCs</td>
<td></td>
</tr>
<tr>
<td>Singapore Studies</td>
<td>CEG Technical Electives - 20 MCs</td>
<td></td>
</tr>
<tr>
<td>Thinking and Expression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 MCs</td>
<td>108 MCs</td>
<td>32 MCs</td>
</tr>
</tbody>
</table>

**Total (minimum) MCs for graduation = 160**

Refer to the respective File For Graduation (FFG) checklist at [https://ceg.nus.edu.sg/students/FFG_Checklists.html](https://ceg.nus.edu.sg/students/FFG_Checklists.html)
## CEG Modular Requirements and Credits

### AY2017/18 direct intake

<table>
<thead>
<tr>
<th>Modular Requirements</th>
<th>MCs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNIVERSITY LEVEL REQUIREMENTS</strong></td>
<td>20</td>
</tr>
<tr>
<td>1 x General Education Module (GEM) from each of:</td>
<td></td>
</tr>
<tr>
<td>- Human Cultures GEH1xxx</td>
<td></td>
</tr>
<tr>
<td>- Asking Questions GEQ1000</td>
<td></td>
</tr>
<tr>
<td>- Quantitative Reasoning GER1000</td>
<td></td>
</tr>
<tr>
<td>- Singapore Studies GES1xxx</td>
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</tr>
<tr>
<td>- Thinking and Expression GET1xxx</td>
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<tr>
<td><strong>UNRESTRICTED ELECTIVE MODULES</strong></td>
<td>32</td>
</tr>
<tr>
<td>- Including ES1103 (if not exempted)#</td>
<td></td>
</tr>
<tr>
<td><strong>PROGRAMME REQUIREMENTS</strong></td>
<td>108</td>
</tr>
<tr>
<td>Faculty Requirements</td>
<td>6</td>
</tr>
<tr>
<td>CS2101 Effective Comm for Computing Professionals</td>
<td>4</td>
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<tr>
<td>EG2401A Engineering Professionalism</td>
<td>2</td>
</tr>
<tr>
<td><strong>CEG Core Modules</strong></td>
<td>82</td>
</tr>
<tr>
<td>CG1111 Engineering Principles and Practice I</td>
<td>6</td>
</tr>
<tr>
<td>CG1112 Engineering Principles and Practice II</td>
<td>6</td>
</tr>
<tr>
<td>CS1010 Programming Methodology</td>
<td>4</td>
</tr>
<tr>
<td>CS1231 Discrete Structures</td>
<td>4</td>
</tr>
<tr>
<td>MA1511 Engineering Calculus</td>
<td>2</td>
</tr>
<tr>
<td>MA1512 Differential Equations for Engineering</td>
<td>2</td>
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<tr>
<td>MA1508E Linear Algebra for Engineering</td>
<td>4</td>
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<tr>
<td>CG2023 Signals &amp; Systems</td>
<td>4</td>
</tr>
<tr>
<td>CG2027 Transistor-level Digital Circuits</td>
<td>2</td>
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<tr>
<td>CG2028 Computer Organization</td>
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<td>CG2271 Real-time Operating Systems</td>
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<tr>
<td>CS2040C Data Structures and Algorithms</td>
<td>4</td>
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<tr>
<td>CS2113T Software Engineering &amp; Obj-Oriented Prog</td>
<td>4</td>
</tr>
<tr>
<td>EE2026 Digital Design</td>
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<tr>
<td>ST2334 Probability &amp; Statistics</td>
<td>4</td>
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<tr>
<td>CG3207 Computer Architecture OR</td>
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<tr>
<td>CS3230 Design and Analysis of Algorithms</td>
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<tr>
<td>Industrial Attachment (CP3880 OR EG3611)</td>
<td>10</td>
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<tr>
<td>CG4002 Computer Engineering Capstone Project</td>
<td>8</td>
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<tr>
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<td>4</td>
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<td>CEG Technical Electives</td>
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<tr>
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# For students who have not passed or been exempted from the Qualifying English Test at the point of admission.

[https://ceg.nus.edu.sg/curriculum/requirements.html](https://ceg.nus.edu.sg/curriculum/requirements.html)
## CEG Modular Requirements and Credits

### AY2017/18 Poly intake

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[https://ceg.nus.edu.sg/curriculum/requirements.html](https://ceg.nus.edu.sg/curriculum/requirements.html)
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)
- Recommended study schedules
- Three pathways
- Industrial Attachment
Core modules / Major requirements

- **Core Modules***
  - ✓ CG3207 Computer Architecture OR CS3230 Design and Analysis of Algorithms
  - ✓ CG4002 Computer Engineering Capstone Project
  - ✓ EE4204 Computer Networks
  - ✓ EG2401A Engineering Professionalism
  - ✓ Industrial Attachment

+ (at least) **20 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.*
Core modules / Major requirements

- CG4002 CEG Capstone Project (8 MCs)
  - Compulsory for students in PPP and RfP
  - Over one semester; similar to CG3002 (6 MCs) taken by your seniors who did not do EPPs
  - CG3002 will be (has to be) offered one last time next semester
  - Consequently, CG4002 will be first offered in Sem 2, AY2019/20 with a cap on enrolment of (max) 90 students per semester
  - Possible scenarios/study plans
    - IA (sem 5) -> CG4002 (sem 6) -> Modules/TEs (sem 7)
    - IA (sem 5) -> Modules/TEs (sem 6) -> CG4002 (sem 7 & 8)
    - IA (sem 5) -> SEP (sem 6) -> CG4002 (sem 7 or 8)
    - SEP (sem 5) -> IA (sem 6) -> CG4002 (sem 7 or 8)
    - Modules/TEs (sem 5) -> IA (sem 6) -> CG4002 (sem 7 or 8)
    - Modules/TEs (sem 5) -> CG4002 (sem 6) -> IA (sem 7)
    - NOC (sem 5 & 6) -> CG4002 (sem 7 or 8)

You are highly recommended to apply for ATAP/IA NOW, and go for IA next semester.
Points to Consider

- Core modules / Major requirements
- Choice of Technical Electives in Year 3 & 4 (some choose to start in year 2)
- Recommended study schedules
- Three pathways
- Industrial Attachment
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 to fulfill CEG TE requirements. Generally, a CS/EE3xxx module will count as TE Breadth, while a CS/EE4xxx 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 40 modules (offered by CS/ECE) are available!

Only FIVE TE(s) (equivalent to 20 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]
- 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)
   [https://ceg.nus.edu.sg/students/third_year.html]
   (under ‘Academic Information/Useful Links’)

3. Info on CEG Prog/TE rules [https://ceg.nus.edu.sg/students/ceg3TE/]
   For above links #2 & #3, please check for updated version in June 2019.
Technical Electives - Requirements

(a) Depth (D) requirement

At least 12 MCs of Depth technical electives

(b) Modular credits requirement

At least 20 MCs of technical electives

Modules can come from Any/None of the concentrations!

CS/EE3xxx -> TE Breadth

CS/EE4xxx -> TE Depth
The CEG concentrations are:

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

https://ceg.nus.edu.sg.curriculum/electives-AY17.html
CEG concentration

Communications & Networking
CS2107 Introduction to Information Security
CS3103 Computer Networks Practice
EE3131C Communication Systems
CS4222 Wireless Networking
CS4226 Internet Architecture
EE4210 Network Protocols and Applications
CS5223 Distributed Systems
CS5321 Network Security
EE5135 Digital Communications

[Check TE masterlist in June.]
CEG concentration

Embedded Computing
CG3207 Computer Architecture
CS2107 Introduction to Information Security
CS3103 Computer Networks Practice
EE3731C Signal Processing Methods
CS4222 Wireless Networking
CS4223 Multi-Core Architectures
EE4218 Embedded Hardware Systems Design
EE4415 Integrated Digital Design
CS5272 Embedded Software Design
EE5903 Real-time Systems

Students are required to read either CG3207 or CS3230 as Programme requirements. Only students who passed both modules can count (the other/second) one as TE Breadth. CG3207 is only offered once per AY, in sem 1.
CEG concentration

**Large-Scale Computing**

CS2102 Database Systems  
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  
CS4221 Database Applications Design and Tuning  
CS4223 Multi-Core Architectures  
CS4224 Distributed Databases  
CS4231 Parallel & Distributed Algorithms  
EE4210 Network Protocols and Applications  
EE4218 Embedded Hardware System Design

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

CS3223 is the only level 3000 TE Depth.

Only students who passed both CS3230 AND CG3207 can count (the other/second) one as TE Breadth.
CEG concentration

Intelligent Systems
CS3240 Interaction Design
CS3244 Machine Learning
EE3331C Feedback Control Systems
CS4244 Knowledge-based Systems
CS4246 AI Planning and Decision Making
CS4248 Natural Language Processing
EE4305 Introduction to Fuzzy/Neural Systems
EE4308 Advances in Intelligent Systems and Robotics
CS5242 Neural Networks & Deep Learning
CS5339 Theory and Algorithms for Machine Learning
EE5904 Neural Networks
EE5907 Pattern Recognition
The Need to Plan Ahead
[especially if you are particular about your choice of TEs]

Intelligent Systems
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/CS3245 (only offered in sem 2) AND ST2334

Pre-req of CS3243: CS2040C AND CS1231

CS1231, CS2040C & ST2334 (Year 2) -> IA (sem 5) -> CS3243/5 (sem 6)
-> CS4246/8 (sem 7) and/or CS4244 (sem 8)

Need to 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  
EE3731C Signal Processing Methods  
CS4240 Interaction Design for Virtual and Augmented Reality  
CS4243 Computer Vision and Pattern Recognition  
CS4247 Graphics Rendering Techniques  
CS4249 Phenomena and Theories of Human-Computer Interaction  
CS4347 Sound and Music Computing  
CS4351 Real-Time Graphics  
EE4212 Computer Vision  
EE4604 Biological Perception in Digital Media  
EE4704 Introduction to Computer Vision and Image Processing

Note: Mutual preclusion for CS4243 and EE4212
CEG concentration

System-on-a-Chip Design
CG3207 Computer Architecture
EE3104C Introduction to RF and Microwave Systems & Circuits
EE3408C Integrated Analog Design
CS4223 Multi-Core Architectures
EE4104 Microwave Circuits & Devices
EE4218 Embedded Hardware Systems Design
EE4415 Integrated Digital Design
EE4505 Power Semiconductors Devices & ICs
EE5518 VLSI Digital Circuit Design

Pre-requisite(s) of some TEs are CEG core modules.
CG2028 & CG2271 (sem 4) -> CG3207 (sem 5) -> CS4223 (sem 6 or 8)
EE2026 -> EE4218 (sem 5 or 7) and/or EE4415 (sem 6 or 8)

Need to read PC2020 as UEM, if keen in EE3104C
PC2020 (UEM) -> EE3104C (sem 7) -> EE4104 (sem 8)

Only students who passed both CS3230 AND CG3207 can count (the other/second) one as TE Breadth. CG3207 is only offered once per AY, in sem 1.
Technical Electives - Advices

- Be flexible in your choice of technical electives
- Take more technical electives, and declare the ‘extra’ as UEM (32 MCs)
- Plan ahead!
- Interest vs Ability [Cannot exercise S/U option]
- Not necessary to focus in a specific concentration i.e. not necessary to read 16 MCs of TEs from the same concentration
- OK to read CS/EE-coded 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)
- Recommended study schedules
- Three pathways
- Industrial Attachment
Refer to https://ceg.nus.edu.sg/students/studyschedule.html

ULR/GEMs and UEM requirements are reflected randomly. Remember to read/clear these requirements.

Semestral workload: Minimum 18 MCs, and
up to 25 MCs (if CAP >= 2.0)
up to 20 MCs (if CAP < 2.0)

- While SEP students may propose mapping for CG4002, it will likely be tough to map suitably since it’s the capstone project.
- Be mindful about workload in the semester that you intend to read CG4002. Recommended to keep to the average workload of 20 MCs [i.e. CG4002 and three regular modules].

- If any deviation, use the recommended schedules (as per your cohort/intake) and pre-req chart for CEG AY17 as reference, and revise a plan (sem 1 to sem 8) for yourself.
<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>CG2023 Signals &amp; Systems</td>
<td>CP3880 ATAP (12 MCs)</td>
<td>CG4002 Computer Engineering Capstone Project (8 MCs)</td>
<td>CG3207 OR CS3230</td>
<td>Technical Elective Depth</td>
</tr>
<tr>
<td>CG2027n8 OR CG2271</td>
<td>EG3611A IA (10 MCs)</td>
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<td>Technical Elective Breadth</td>
</tr>
<tr>
<td>ST2334 Probability &amp; Statistics</td>
<td>EE4204 Computer Comms Networks I</td>
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<tr>
<td>GEH1xxx</td>
<td>EG2401 A Engrg Profsm (2 MCs)</td>
<td>GET1xxx</td>
<td>UEM5</td>
<td>UEM7</td>
</tr>
<tr>
<td>UEM2</td>
<td>UEM3</td>
<td>UEM4</td>
<td>UEM6</td>
<td>UEM8</td>
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**IMPORTANT:**
- Students are encouraged to use UEM space to take more technical electives (TEs).
- “Extra” TEs can count as UEM but NOT vice versa.
### Recommended Study Schedules

**AY2017/18 Poly intake**
(Exempted from CG1111)

<table>
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<th>May - Jul</th>
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<td>Technical Elective Depth</td>
<td>GES1xxx</td>
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</tr>
<tr>
<td>TE Breadth</td>
<td>GEH1xxx</td>
<td>UEM2</td>
<td></td>
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<tr>
<td>GET1xxx</td>
<td>TE (2 MCs) (if did not do internship)</td>
<td>UEM3 (if did not do internship)</td>
<td></td>
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<td>22 MCs</td>
<td>6 or 0 MCs</td>
<td>20 or 22 MCs</td>
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**IMPORTANT:**
- In lieu of IA (10 MCs), Poly students are required to take MA1301 (if not exempted), PC1222 and internship/TE (totaling 10 MCs).
- Students are encouraged to use UEM space to take more technical electives (TEs).
- “Extra” TEs can count as UEM but NOT vice versa. Poly intake who did not do SIP/VIP, will need to read TE (at least 2 MCs), to make for shortfall due to IA.

If keen, apply for SIP/VIP now
### Recommended Study Schedules

**AY2017/18 Poly intake**

(Not exempted from CG1111)

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**IMPORTANT:**

- In lieu of IA (10 MCs), Poly students are required to take MA1301 (if not exempted), PC1222 and internship/TE (totaling 10 MCs).
- Students are encouraged to use UEM space to take more technical electives (TEs).
- "Extra" TEs can count as UEM but NOT vice versa. Poly intake who did not do SIP/VIP, will need to read TE (at least 2 MCs), to make for shortfall due to IA.

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If keen, apply for SIP/VIP now
Points to Consider

- Core modules / Major requirements
- Choice of Technical Electives in Year 3 & 4 (some choose to start in year 2)
- Recommended study schedules
- Three pathways
- Industrial Attachment
# Three Pathways for CEG AY17

<table>
<thead>
<tr>
<th>Internship</th>
<th>Project Module(s)</th>
<th>Pathway requirement(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPP</td>
<td>20 - 24 wks ATAP/IA</td>
<td>CG4002: compulsory FYP/CG4001: optional</td>
</tr>
<tr>
<td>RfP</td>
<td>CG4002: compulsory, CG4003: 4-weeks internship before/amidst research-based FYP (over two semesters)</td>
<td>CS5/EE5 x1, CS4/CS5/EE5 x1</td>
</tr>
</tbody>
</table>

- Although CG4001 BEng Dissertation (also known as Final Year Project) is no longer compulsory, PPP students may consider taking up CG4001 OR 8 MCs research-oriented project offered by CS (CP4106 Computing Project) or ECE (EE4002R Research Capstone).
  
  CG4001 (12 MCs) will be mapped to [8 MCs TE Depth and 4 MCs UEM].
  
  CP4016/EE4002R will be mapped to 8 MCs TE Depth.
- iDP students need to take EG4301/A (over two semesters) as UEM
- RfP students are recommended to take CS2309 [CS Research Methodology](https://ceg.nus.edu.sg/students/documents/ThreePathways_CEG_AY17.pdf) or EG2605 Undergraduate Research Opportunities Programme as UEM (to help in decision-making).
Three Pathways for CEG AY17

If still undecided between PPP vs RfP…

• As PPP students are NOT allowed to take two rounds of 3-months internship, in lieu of 20-weeks (at least) IA, a direct implication is that affected students (i.e. switching back to PPP) are still expected to complete 20-weeks 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 RfP will not/unlikely delay graduation. The advisory is mainly intended for undecided 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 your EduRec record can be updated accordingly. For queries relating to iDP, check with DCP office directly.

https://ceg.nus.edu.sg/students/documents/ThreePathways_CEG_AY17.pdf
Three Pathways for CEG AY17

The **FFG checklists** are intended for (the bulk of) students in PPP. RfP and iDP students should refer to the [pathway mapping for CEG AY17](https://ceg.nus.edu.sg/students/documents/ThreePathways_CEG_AY17.pdf) and use it to cross-check against the FFG checklist.

### Three Pathways for CEG AY2017/18 intake

<table>
<thead>
<tr>
<th>CEG</th>
<th>Practising Professional Pathway</th>
<th>Research-focused Pathway</th>
<th>Innovation &amp; Design Pathway (iDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PPP</td>
<td>RfP</td>
<td>(with Second Major in Innovation &amp; Design)</td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>108 MCs</td>
<td>CEG TE x 1</td>
<td>CEG TE x 1</td>
<td>CEG TE x 1</td>
</tr>
<tr>
<td></td>
<td>CEG TE Depth x 1</td>
<td>CEG TE Depth x 1</td>
<td>CEG TE Depth x 1</td>
</tr>
<tr>
<td>[including 20 MCs of TEs]</td>
<td>CEG TE x 1 (2 MCs if took ATAP)</td>
<td>CEG TE x 1 (2 MCs)</td>
<td>CEG TE x 1 (6 MCs)</td>
</tr>
<tr>
<td></td>
<td>CG4002 (8 MCs)</td>
<td>CG4002 (8 MCs)</td>
<td>CG4003 (12 MCs)</td>
</tr>
<tr>
<td></td>
<td>CP3880 (12 MCs) OR EG3611A (10 MCs)</td>
<td>EG3611A (10 MCs)</td>
<td>EG3301R (12 MCs)</td>
</tr>
<tr>
<td>UEM</td>
<td>ES1103 (if not exempted)</td>
<td>e.g. CP3208 AND CP3209</td>
<td>e.g. CS2309 OR EG2605</td>
</tr>
<tr>
<td>32 MCs</td>
<td></td>
<td></td>
<td>ES1103 (if not exempted)</td>
</tr>
<tr>
<td>ULR</td>
<td>GE pillars x 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 MCs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As of 1 June 2018
Points to Consider

- Core modules / Major requirements
- Choice of Technical Electives in Year 3 & 4 (some choose to start in year 2)
- Recommended study schedules
- Three pathways
- Industrial Attachment
[Refer to Dr Rajesh’s presentation]
FYP-related awards
[University-level]

[From slide #28]
- Although CG4001 BEng Dissertation (also known as Final Year Project) is no longer compulsory, PPP students may consider taking up CG4001 OR 8 MCs research-oriented project offered by CS (CP4106 Computing Project) or ECE (EE4002R Research Capstone).
  CG4001 (12 MCs) will be mapped to [8 MCs TE Depth and 4 MCs UEM].
  CP4016/EE4002R will be mapped to 8 MCs TE Depth.
- iDP students need to take EG4301/A (over two semesters) as UEM
- RfP students need to take CG4003 (12 MCs).

• IEEE Singapore Computer Society Book Prize
  https://ceg.nus.edu.sg/students/awards_commencement.html

• Outstanding Undergraduate Researcher Prize
  https://ceg.nus.edu.sg/students/achievements.html
Completing Your Skillset

- **Second Majors**
  - Many are available
  - Management
  - Innovation & Design
  - Systems Engineering
  - Mathematics
  - Statistics
  - Business Analytics

- **Minors**
  - Many are available, including Business Analytics
  - Management
  - Entrepreneurship
  - Statistics
  - Economics
  - Financial Mathematics

**Important Note**
- No guarantee for places - you have to bid for it!
Internet of Things (IoT)

30 BILLION
Sensor enabled objects connected to networks by 2020

212 BILLION
Total number of available sensor enabled objects by 2020

212B is 28x the total population of the world

Images: various sources
IoT Specialization

Introduction to IoT
IoT system architecture, Devices, Communications, Cloud computing, Data analytics, Security

Data Science for IoT
Bayesian data analysis, Regression, Decision trees, SVM, Neural networks, Unsupervised learning

Modern Microelectronic Devices & Sensors
Sensors and devices for IoT applications

3 x Technical Electives
- Wireless/sensor networks
- Computer networks
- Embedded hardware design
- Embedded software design
- Machine learning
- Design / Research capstone / Thematic projects in IoT

- ✔ Computer Engineering
- ✔ Electrical Engineering
Robotics Specialization

Robotics System Design
ROS Platform & architecture, Sensor & actuator integration

3 x Technical Electives
Robot mechanics
Autonomous robot systems
Machine learning for robotics
Robot perception
Robotics in Rehabilitation
Intelligent medical robotics
Human – robot interaction
Soft robotics

Final Year Robotics Project

- Biomedical Engineering
- Computer Engineering
- Electrical Engineering
- Mechanical Engineering