

Briefing for CEG students (AY2016 intake)

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

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Joint Academic Committee (JAC)

BEng(CEG) Curriculum Structure

AY2016/17 intake

University Level Requirements (ULR)	CEG Programme / Major Requirements	Unrestricted Elective Modules (UEM)
One General Education Module (GEM) from each of the five pillars: Human Cultures Asking Questions Quantitative Reasoning Singapore Studies Thinking and Expression	Faculty reqs: CS2101, EG2401 & ES1531 - 11 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	16 MCs Offered by Any Faculty/School
20 MCs	125 MCs	16 MCs
Total (minimum) MCs for graduation = 161		

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

CEG Modular Requirements and Credits



AY2016/17 direct intake

Modular Requirements	MCs		
UNIVERSITY LEVEL REQUIREMENTS	20		
1 x General Education Module (GEM) from each of: - Human Cultures GEH1xxx - Asking Questions GEQ1000 - Quantitative Reasoning GER1000 - Singapore Studies GES1xxx - Thinking and Expression GET1xxx	5 x 4		
UNRESTRICTED ELECTIVE MODULES - Including ES1103 (if not exempted)#	16		
PROGRAMME REQUIREMENTS	125		
Faculty Requirements	11		
CS2101 Effective Comm for Computing Professionals	4		
EG2401 Engineering Professionalism	3		
ES1531 Critical Thinking & Writing	4		
CEG Core Modules	68		
CG1001 Introduction to Computer Engineering	2		
CG1108 Electrical Engineering	4		
CG2023 Signals & Systems	4		
CG2271 Real-time Operating Systems	4		
CG3207 Computer Architecture	4		
		CS1010 Programming Methodology	4
		CS1020 Data Structures and Algorithms I	4
		CS1231 Discrete Structures	4
		CS2103T Software Engineering	4
		EE2020 Digital Fundamentals	5
		EE2021 Devices & Circuits	4
		EE2024 Programming for Computer Interfaces	5
		EE3204 Computer Communication Networks I	4
		MA1505 Mathematics I	4
		MA1506 Mathematics II	4
		PC1432 Physics IIE	4
		ST2334 Probability & Statistics	4
		Industrial Attachment (CP3880 OR EG3611)	12
		CEG Project Modules	22
		CG3002 Embedded Systems Design Project	6
		EE3031 Innovation & Enterprise I	4
		CG4001 B.Eng. Dissertation (over 2 semesters)	12
		CEG Technical Electives	12
		TOTAL	161

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/ProgReqAY16.html>

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CEG Modular Requirements and Credits



AY2016/17 Poly intake

Modular Requirements	MCs		
UNIVERSITY LEVEL REQUIREMENTS	20		
1 x General Education Module (GEM) from each of: - Human Cultures GEH1xxx - Asking Questions GEQ1000 - Quantitative Reasoning GER1000 - Singapore Studies GES1xxx - Thinking and Expression GET1xxx	5 x 4		
UNRESTRICTED ELECTIVE MODULES - Including ES1103 (if not exempted)# - 16 MCs (exempted)	16		
PROGRAMME REQUIREMENTS	125		
Faculty Requirements	11		
CS2101 Effective Comm (exempted)	4		
EG2401 Engineering Professionalism	3		
ES1531 Critical Thinking & Writing	4		
CEG Core Modules	68		
CG1001 Introduction to Computer Engineering	2		
CG1108 Electrical Engineering	4		
CG2023 Signals & Systems	4		
CG2271 Real-time Operating Systems	4		
CG3207 Computer Architecture	4		
		CS1010 Programming Methodology	4
		CS1020 Data Structures and Algorithms I	4
		CS1231 Discrete Structures	4
		CS2103T Software Engineering	4
		EE2020 Digital Fundamentals	5
		EE2021 Devices & Circuits	4
		EE2024 Programming for Computer Interfaces	5
		EE3204 Computer Communication Networks I	4
		MA1505 Mathematics I	4
		MA1506 Mathematics II	4
		PC1432 Physics IIE	4
		ST2334 Probability & Statistics	4
		PC1222 + MA1301/TE + UEM (exempted)	12
		CEG Project Modules	22
		CG3002 Embedded Systems Design Project	6
		EE3031 Innovation & Enterprise I	4
		CG4001 B.Eng. Dissertation (over 2 semesters)	12
		CEG Technical Electives	12
		TOTAL	161

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

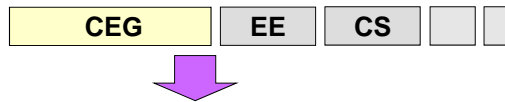
<http://ceg.nus.edu.sg/curriculum/ProgReqAY16.html>

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CEG Curriculum



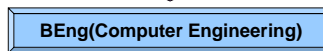
- **Year 1 & 2:**
Wide coverage of Math, Engineering, Computing and Scientific fundamentals



- **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



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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

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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.

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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:

1. NUS Bulletin <http://www.nus.edu.sg/registrar/nusbuletin/modulesearch.html>
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 June 2018.

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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!

CS/EE3xxx
-> TE Breadth

CS/EE4xxx
-> TE Depth

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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>

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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
EE4210 Computer Communication Networks II

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

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)

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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 TEs,

IA (sem 5) -> EE3204 (sem 6) -> EE4210 (sem 8)

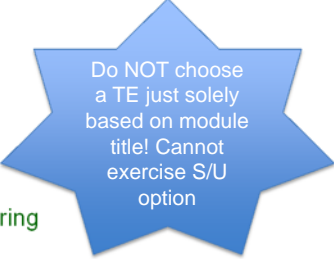
EE3204 (sem 5) -> IA (sem 6) -> CS4222 (sem 8)

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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.

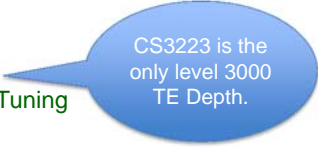


Do NOT choose a TE just solely based on module title! Cannot exercise S/U option

The Need to Plan

Large-Scale Computing

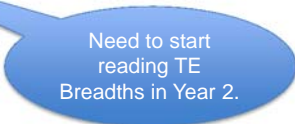
CS2010 Data Structures & Algorithms II
CS2102 Database Systems
CS3223 Database Systems Implementation
CS4221 Database Applications Design and Tuning
CS4224 Distributed Databases



CS3223 is the only level 3000 TE Depth.

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)



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

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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 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

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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

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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)

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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)

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Points to Consider



- Core modules / Major requirements
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- **IA semester**
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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/>

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IA semester



- 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/>

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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).

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Points to Consider



- Core modules / Major requirements
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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>

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Recommended Study Schedules AY2016/17 direct intake



Sem 4	Sem 5	Sem 6	Sem 7	Sem 8
CG2023 Signals & Systems	CP3880 ATAP or EG3611 IA	CG3002 Embedded Systems Design Project	CG4001 BEng Dissertation	CG4001 BEng Dissertation
CG2271 OR EE2027		EE3031 Innovation & Enterprise I	Technical Elective Breadth	Technical Elective Depth
EE2024 Programming for Computer Interfaces		EE3204 Computer Comms Networks I	GET1xxx	Technical Elective Depth
ST2334 Probability & Statistics	CG3207 Computer Architecture	UEM	UEM	UEM
GEH1xxx	EG2401 Engrg Profsm	GES1xxx		
21 MCs	19 MCs	22 MCs	18 MCs	18 MCs

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

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 CG1108)



Sem 4	Sem 5	Sem 6
CG2023 Signals & Systems	CG4001 BEng Dissertation	CG4001 BEng Dissertation
CG3002 Embedded Systems Design Project	CG3207 Computer Architecture	EE3031 Innovation & Enterprise I
EE3204 Computer Comms Networks I	EG2401 Engrg Profsm	Technical Elective Depth
PC1432 Physics IIE	Technical Elective Breadth	Technical Elective Depth
ST2334 Probability & Statistics	GES1xxx	GET1xxx
22 MCs	21 MCs	22 MCs

Bid/Read
EG2401 (3 MCs)
in AY18/19
(revised 2 MCs
version for AY17
intake)

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.

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Recommended Study Schedules AY2016/17 Poly intake

(NOT exempted from CG1108)



Sem 4	Sem 5	Sem 6	Sem 7
CG2023 Signals & Systems	CG3002 Embedded Systems Design Project	CG4001 BEng Dissertation	CG4001 BEng Dissertation
CG2271 Real-Time Operating Syst	CG3207 Computer Architecture	EG2401 Engrg Profsm	Technical Elective Depth
EE2024 Prog for Computer Interfaces	EE3204 Computer Comms Networks I	EE3031 Innovation & Enterprise I	Technical Elective Depth
PC1432 Physics IIE	ST2334 Probability & Statistics	Technical Elective Breadth	
GEH1xxx	GES1xxx	GET1xxx	
21 MCs	22 MCs	21 MCs	14 MCs

Bid/Read
EG2401 (3 MCs)
in AY18/19
(revised 2 MCs
version for AY17
intake)

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.

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Three Pathways for CEG AY16



	Internship	FYP	Pathway requirements
PPP	6-months ATAP/IA	CG4001	CS2103/T & EE3031
iDCP	3-months SIP/VIP	Refer to iDCP site http://www.eng.nus.edu.sg/edic/programme-iDCP2016.html	
RfP	SIP/VIP @ Research institutes or labs	CG4001 Research-based FYP	Technical electives

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).

http://ceg.nus.edu.sg/students/documents/ThreePathways_CEG_AY16.pdf

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Three Pathways for CEG AY16



If still undecided between PPP vs RfP...

- 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 RfP 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.

http://ceg.nus.edu.sg/students/documents/ThreePathways_CEG_AY16.pdf

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Three Pathways for CEG AY16



The [FFG checklists](#) are intended for (the bulk of) students in PPP.

RfP and iDCP students should refer to the [pathway mapping for CEG AY16](#) and use it to cross-check against the FFG checklist.

As of 7 February 2018

Three Pathways for CEG AY2016/17 intake

CEG	Practising Professional Pathway PPP	Research-focused Pathway RfP	Innovation & Design-Centric Pathway iDCP
Major 125 MCs (including Three TEs)	Core Modules – 79 MCs CG1001 (2 MCs), CG1108, CG2023, CG2271, CG3207 CS1010, CS1020, CS1231, CS2101, CS2103/7 EE2020 (5 MCs), EE2021, EE2024 (5 MCs), EE3204 EG2401 (3 MCs), ES1531 MA1505, MA1506, RC1422, ST2224		
	CP3880 ATAP OR EG3611 IA (12 MCs) CG3002 (6 MCs) EE3031	CP3200 SIP OR EG3612 VIP (6 MCs) CEG TE (6 MCs) CG3002 (6 MCs)	CP3200 SIP OR EG3612 VIP (6 MCs) EG3301R (12 MCs)
	CEG TE x 1 CEG TE Depth x 1 CEG TE Depth x 1 CG4001 (12 MCs)	CEG TE x 1 TE #1 (from CS4/CS5/EE5xxx modules) TE #2 (from CS4/EE4/CS5/EE5xxx modules) CG4001 (12 MCs)	IDCP I&E elective #1 IDCP I&E elective #2 CEG TE x 1 CEG TE Depth x 1 EG4301 (12 MCs)
	UEM 16 MCs	ES1103 (if not exempted) OR UEM UEM UEM UEM	ES1103 (if not exempted) OR UEM CS2309 OR EG2605 OR UEM* UEM UEM
ULR 20 MCs	GE pillars x 5		
Total (min) MCs	161		

http://ceg.nus.edu.sg/students/documents/ThreePathways_CEG_AY16.pdf

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