

Information Session for CEG2 Students

- Major Requirements
- Technical Electives
- Industrial Attachment
- Three pathways (for AY16 Poly intake)

9 March 2017, 4pm @ LT1

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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

INFORMATION SESSION FOR CEG2 STUDENTS

B.Eng. (CEG) Curriculum Structure



AY2015/16 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 & 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	16 MCs Offered by Any Faculty/School
20 MCs	124 MCs	16 MCs

Total (minimum) MCs for graduation = 160

- *AQ pillar not ready, so AY15 intake is required to read additional module from HC, SS or T&E pillar.

 ** CEG AY15 intake is required to read GET1021 Critical Thinking & Writing, to fulfill T&E pillar.

 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



Modular Requirements		
UNIVERSITY LEVEL REQUIREMENTS	20	
1 x General Education Module (GEM) from each of:	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	
HR2002 Human Capital in Organizations	3	
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	

AY2015/16 intake

TOTAL	160
CEG Technical Electives	12
CG4001 B.Eng. Dissertation (over 2 semesters)	12
EE3031 Innovation & Enterprise I	4
CG3002 Embedded Systems Design Project	6
CEG Project Modules	22
Industrial Attachment (CP3880 OR EG3611)	12
ST2334 Probability & Statistics	4
PC1432 Physics IIE	4
MA1506 Mathematics II	4
MA1505 Mathematics I	4
EE3204 Computer Communication Networks I	4
EE2024 Programming for Computer Interfaces	5
EE2021 Devices & Circuits	4
EE2020 Digital Fundamentals	5
CS2103T Software Engineering	4
CS1231 Discrete Structures	4
CS1020 Data Structures and Algorithms I	4
CS1010 Programming Methodology	4

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/ProgRegAY14.html

B.Eng. (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.ceg.nus.edu.sg/students/FFG_Checklists.html

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CEG Modular Requirements and Credits



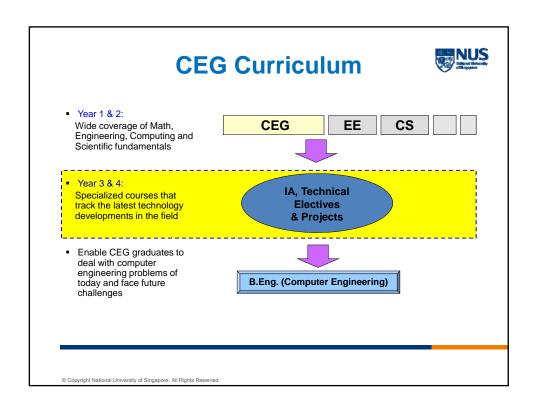
Modular Requirements		
UNIVERSITY LEVEL REQUIREMENTS	20	
X General Education Module (GEM) from each of: Human Cultures GEH1xxx Asking Questions GE01000 Quantitative Reasoning GER1000 Singapore Studies GES1xxx Thinking and Expression GET1xxx	5 x 4	
UNRESTRICTED ELECTIVE MODULES - Including ES1103 (if not exempted)# - 16 MCs (exempted)	16	
PROGRAMME REQUIREMENTS		
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	

AY2016/17 (Poly) intake

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



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.

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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

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 - 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:

- 1. NUS Bulletin http://www.nus.edu.sg/registrar/nusbulletin/modulesearch.html
- 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!

CS/EE3xxx -> TE Breadth CS/EE4xxx -> TE Depth

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Technical Electives - ConcentrationsNUS



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



Breadth (which can be declared as UEM)

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)

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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 Complier 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 TEs,

EE3204 (sem 5) -> IA (sem 6) -> CS3103 (sem 7) -> CS4222 (sem 8)

IA (sem 5) -> EE3204 (sem 6) -> CS3103 (sem 7) -> EE4210 (sem 8)



Do NOT choose a TE just based on its module

Cannot exercise

S/U option

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 Complier 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

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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

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

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.



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



Students who read CS4243 are precluded from

EE4212

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

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CEG concentration



NOT be offered in

System-on-a-Chip Design

EE3407 Analog Electronics

EE3408C Integrated Analog Design

CS4223 Multi-Core Architectures

EE4214 Real-time Embedded Systems

EE4218 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)

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 <u>Module Preference Exercise</u> (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.

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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

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)
- IA semester
- Recommended study schedules

Recommended Study Schedules NUS



- 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



Sem 4	Sem 5	Sem 6	Sem 7	Sem 8
CG2023 Signals & Systems	CP3880	CG3002 Embedded Systems Design Project	CG4001 B.Eng. Dissertation	CG4001 B.Eng. Dissertation
CG2271 Real-Time Operating Systems	Or EG3611	EE3031 Innovation & Enterprise I	HR2002 Human Capital in Organizations	Depth Elective
EE2024 Programming for Computer Interfaces	IA	EE3204 Computer Comms Networks I	Breadth Elective	Depth Elective
ST2334 Probability & Statistics	CG3207 Computer Architecture	UEM 1	UEM 2	UEM 4
GEH1xxx	EG2401 Engrg Profsm	GEQ GEH/GES/GET	UEM 3	
21 MCs	19 MCs	22 MCs	21 MCs	18 MCs

- 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 AY2015/16 direct intake



Sem 4 -	Sem 5	Sem 6	Sem 7	Sem 8
CG2023 Signals & Systems	CG3002 Embedded Systems Design Project	CP3880	CG4001 B.Eng. Dissertation	CG4001 B.Eng. Dissertation
CG2271 Real-Time Operating Systems	CG3207 Computer Architecture	ATAP or	HR2002 Human Capital in Organizations	Depth Elective
EE2024 Programming for Computer Interfaces	EE3204 Computer Comms Networks I	EG3611 IA	Breadth Elective	Depth Elective
ST2334 Probability & Statistics	EG2401 Engrg Profsm	EE3031 Innovation & Enterprise I	UEM 2	UEM 4
GEH1xxx	GEQ GEH/GES/GET	UEM 1	UEM 3	
21 MCs	21 MCs	20 MCs	21 MCs	18 MCs

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

Recommended Study Schedules AY2016/17 Poly intake In red are the changes as of 23 January 2017 (exempted from CG1108) Sem 5 Sem 6 Sem 2 CG4001 B.Eng. Dissertation CG4001 B.Eng. Dissertation CS1020 CG2271 Real-Time CG2023 Signals & Systems **Operating Syst** Algorithms I EE2024 CG3002 CG3207 EE3031 Programming for Computer Interfaces Innovation & Enterprise I mbedded System Design Project Computer Architecture Discrete Structures ES1531 Critical Thinking & Writing EE3204 EG2401 Engrg Profsm Depth Elective CS2103 mputer Com Networks I Software Engrg MA1505 Math I MA1506 Math II Breadth Elective PC1432 Depth Physics IIE PC1222 ST2334 Probability & Statistics GEQ1000 Fundamentals of GES1xxx GET1xxx Physics II **GEH1xxx** 21 MCs 24 MCs 22 MCs 21 MCs 22 MCs 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 can be taken in any semester. byright National University of Singapore. All Rights Reserved

Recommended Study Schedules AY2016/17 Poly intake

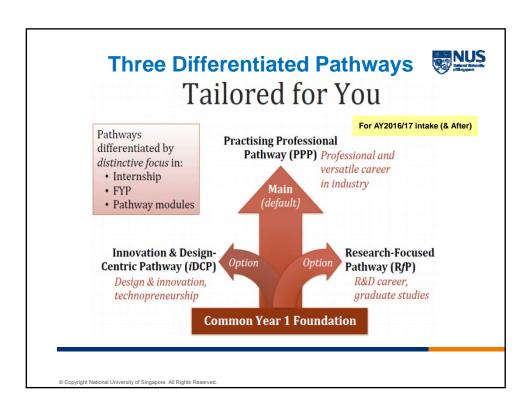


(NOT exempted from CG1108)

Sem 2	Sem 3	Sem 4	Sem 5	Sem 6	Sem 7
CG1108 Electrical Engineering	CS2103 Software Engrg	CG2023 Signals & Systems	CG3002 Embedded Systems Design Project	CG4001 B.Eng. Dissertation	CG4001 B.Eng. Dissertation
CS1020 Data Structures & Algorithms I	EE2020 Digital Fundamentals	CG2271 Real-Time Operating Syst	CG3207 Computer Architecture	EG2401 Engrg Profsm	Depth Elective
CS1231 Discrete Structures	EE2021 Devices & Circuits	EE2024 Prog for Computer Interfaces	EE3204 Computer Comms Networks I	EE3031 Innovation & Enterprise I	Depth Elective
ES1531 Critical Thinking & Writing	MA1506 Math II	PC1432 Physics IIE	ST2334 Probability & Statistics	Breadth Elective	
MA1505 Math I	GEQ1000	GEH1xxx	GES1xxx	GET1xxx	
20 MCs	21 MCs	21 MCs	22 MCs	21 MCs	14 MCs

- 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 can be taken in any semester.
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Three Differentiated Pathways



	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		
RfP	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).
- RfP, highly recommended to take CS2309 <u>CS Research Methodology</u> or EG2605 Undergraduate Research Opportunities Programme (to help in decision-making).

