

**Master-list of CEG Technical Electives available in AY2021/22**  
**(For CEG students from AY2018 intake and after)**

Modules highlighted in green are NOT part of CEG core; students have to take as UEM to meet pre-requisite

In green fonts: amendments (from previous Academic Year)

In red fonts: pending approval/revision

Module(s) added to the list (from previous Academic Year) are tagged with <NEW>

Technical Elective		Hours per week				CA	MCs	SEM	PRE/CO-REQ
		LEC	TUT	LAB	PREP				
<b>COMMUNICATIONS &amp; NETWORKING</b>									
Breadth	CS2107 Introduction to Information Security <small>Co-list under 'embedded computing'</small>	2	1	0	3 4		4	1&2	Pre: CS1010 or equiv
	CS3103 Computer Networks Practice	2	0	2	4 2		4	1	Pre: EE4204
	EE3131C Communication Systems	2	1	0.5	6.5	40%	4	1&2	Pre: EE2023 or equiv Anti: EE3103
Depth	CS4222 Wireless Networking <small>Module title change wef AY15/16 Co-list under 'embedded computing'</small>	2	0	2	4 2		4	2	Pre: EE4204 and (ST2334/ST2131)
	CS4226 Internet Architecture	2	1	0	4 3		4	1	Pre: EE4204 and (ST2334/ST2131)
	EE4210 Network Protocols and Applications <small>Co-list under 'large-scale computing'</small>	2.5	0.5	0	7.5	40%	4	2	Pre: EE2012/ST2334
	CS5223 Distributed Systems <RfP>	3	0	0	3 4		4	1&2 [Evening]	Pre: CS3211
	CS5321 Network Security <RfP>	2	0	0	6 2		4	2 [Evening]	Pre: CS3235
	EE5135 Digital Communications <RfP>						4	2	Registration subject to approval

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		LEC	TUT	LAB	PREP				
<b>EMBEDDED COMPUTING</b>									
Breadth	CG3207 Computer Architecture* Co-list under 'system-on-a-chip design'	2	1	1	6	60%	4	1 [Evening]	Pre: CG2028/EE2028
	CS2107 Introduction to Information Security Co-list under 'comms & networking'	2	1	0	3 4		4	1&2	Pre: CS1010 or its equiv
	CS3211 Parallel and Concurrent Programming Co-list under 'large-scale computing'	2	1	0	3 3		4	2	Pre: CS2106/CG2271
	EE3731C Signal Analytics Co-list under 'interactive digital media'	2	1	0	7	40%	4	1 [Evening]	Pre: EE2012/ST2334 and (EE2023 or equiv)
Depth	CS4222 Wireless Networking Module title change wef AY15/16 Co-list under 'comms & networking'	2	0	2	4 2		4	2	Pre: EE4204 and (ST2334/ST2131)
	CS4223 Multi-core Architectures Co-list under 'large-scale computing' & 'system-on-a-chip design'	2	1	0	3 4		4	1	Pre: (CS2106/CG2271) and (CS3210/CS3220/CG3207)
	EE4218 Embedded Hardware System Design Co-list under 'large-scale computing' & 'system-on-a-chip design'	2	0.5	1	6.5	60%	4	2	Pre: EE2028/CG2028
	EE4415 Integrated Digital Design Co-list under 'system-on-a-chip design'	2	0.5	0.5	7	40% 100%	4	2	Pre: EE2026
	CS5272 Embedded Software Design <RfP>	2	0	0	4 4		4	2 [Evening]	Pre: (CG2271 or CS2106) and (CS2103 or its equiv)
	EE5903 Real-time Systems <RfP>						4	2	Registration subject to approval

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		LEC	TUT	LAB	PREP				
<b>INTELLIGENT SYSTEMS</b>									
Breadth	CS3243 Introduction to Artificial Intelligence	2	1	0	3 4		4	1&2	Pre: (CS2040C or its equiv) and (CS1231/MA1100)
	CS3244 Machine Learning	2	1	0	3 4		4	1&2	Pre: (CS2040C or its equiv), ST2334, MA1511, MA1512 and MA1508E
	EE3331C Feedback Control Systems	3	1	0.5	5.5	40%	4	1&2	Pre: EE2023 or equiv Anti: EE2010
Depth	CS4244 Knowledge-based systems	3	0	0	3 4		4	2	Pre: CS3243
	CS4246 AI Planning and Decision Making	2	1	0	4 3		4	1&2 [Evening]	Pre: (ST2334/ST2131/MA2216) and CS3243
	CS4248 Natural Language Processing	3	0	0	3 4		4	1&2	Pre: (CS3243/CS3245) and (MA2216/ST2131/ST2334)
	EE4305 Fuzzy/Neural Systems for intelligent robotics	2.5	0.5	0.5	6.5	30%	4	2	Pre: EE2023 or equiv
	EE4308 Autonomous Robot Systems	2.5	0.5	0.5	2.5 proj 4 prep	100%	4	2	Pre: EE3331C/ME2142 Ant: EE4306, CS4278
	CS5242 Neural Networks & Deep Learning <RfP>	2	0	0	5 3	100%	4	1&2 [Evening]	Pre: CS3244
	CS5339 Theory and Algorithms for Machine Learning <RfP>	3	0	0	4 3		4	2 [Evening]	Pre: CS3244
	EE5904 Neural Networks <RfP>						4	2	Registration subject to approval
	EE5907 Pattern Recognition <RfP>						4	1&2	Registration subject to approval

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		LEC	TUT	LAB	PREP				
<b>INTERACTIVE DIGITAL MEDIA</b>									
Breadth	CS2108 Introduction to Media Computing	2	1	0	3 4		4	2	Pre: CS2040C or CS2020 Anti: CS3246
	CS3240 Interaction Design	2	1	1	3 3		4	1&2	Pre: CS2113/T
	CS3241 Computer Graphics	2	1	0	3 3		4	1	Pre: CS2020 or (CS2040C and CS2113/T)
	CS3242 3D Modeling and Animation	2	1	1	3 3		4	2	Pre: CS3241 and (PC1221/H2 Physics or equiv) and MA1512 and MA1508E Anti: CS4342
	CS3247 Game Development	3	0	2	3 2		4	2	Pre: CS3241
	CS3249 User Interface Development	2	1	1	3 3		4	2	Pre: CS2103 or equiv
	EE3731C Signal Analytics Co-list under 'embedded computing'	2	1	0	7	40%	4	1 [Evening]	Pre: EE2012/ST2334 and (EE2023 or equiv)
Depth	CS4240 Interaction Design for Virtual and Augmented Reality	2	0	2	4 2		4	2	Pre: CS3240 and MA1301/H2 Math
	CS4243 Computer Vision and Pattern Recognition	3	0	0	3 4		4	1 [Evening]	Pre: CS2113/T, MA1511, MA1512, MA1508E and ST2334 Anti: EE4212
	CS4247 Graphics Rendering Techniques	3	0	0	3 4		4	2	Pre: CS3241
	CS4249 Phenomena and Theories of Human-Computer Interaction	2	0	0	4 4		4	1 [Evening]	Pre: CS3240/NM2213/NM2216
	CS4347 Sound and Music Computing	2	0.5	0.5	4 3		4	2	Pre: MA1511, MA1512, MA1508E and CS2108
	CS4351 Real-Time Graphics	2	1	0	4 3		4	Not offered in AY20	Pre: CS3241
	EE4212 Computer Vision	2	0.5	0	7	40%	4	2 [Evening]	Pre: MA1508E and EE3731C/EE4704 Anti: CS4243
	EE4604 Biological Perception in Digital Media	2	1	0	7	100 %	4	Not offered since AY19	Pre: EE3206/EE3731C/EE4704
	EE4704 Image Processing and Analysis Module code change wef AY18/19	2.5	1.0	0.5	6	25%	4	1	Pre: CG2023 or EE2023 Anti: CS4243, EE3206

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<b>LARGE-SCALE COMPUTING</b>									
Breadth	CS2102 Database Systems	2	1.5	0.5	3 3		4	1&2	Pre: (CS2040C or its equiv) and (CS1231/MA1100) Anti: CS2102S, IT2002
	CS3210 Parallel Computing	2	1	0	3 4		4	1	Pre: CS2100/EE2024/CG2028
	CS3211 Parallel and Concurrent Programming Co-list under 'embedded computing'	2	1	0	3 3		4	2	Pre: CS2106/CG2271
	CS3230 Design & Analysis of Algorithms*	2	1	0	3 3		4	1&2	Pre: (CS2040C or its equiv) and (CS1231/MA1100)
	CS3235 Computer Security	2	1	0	3 3		4	1&2	Pre: EE4204 and (CS2106/CG2271) and CS2107
Depth	CS3223 Database Systems Implementation	2	1	0	3 3		4	2	Pre: (CS2040C or its equiv) and CS2102
	CS4211 Formal Methods for Software Engineering	2	1	0	3 4		4	1	Pre: CS2103 or its equiv
	CS4221 Database Applications Design and Tuning Module title change wef AY15/16	2	1	0	3 4		4	2 [Evening]	Pre: CS3223 Anti: CS5421
	CS4223 Multi-core Architectures Co-list under 'embedded computing' & 'system-on-a-chip design'	2	1	0	3 4		4	1	(CS2106/CG2271) and (CS3210/CS3220/CG3207)
	CS4224 Distributed Databases	2	1	0	3 4		4	1	Pre: CS3223
	CS4231 Parallel & Distributed Algorithms	3	0	0	3 4		4	2 [Evening]	Pre: CS3230/CS3210
	EE4210 Network Protocols and Applications Module title change wef AY18/19 Co-list under 'comms & networking'	2.5	0.5	0	7.5	40%	4	2	Pre: EE2012/ST2334
EE4218 Embedded Hardware System Design Co-list under 'embedded computing' & 'systems-on-a-chip design'	2	0.5	1	6.5	60%	4	2	Pre: EE2024/EE2028/CG2028	

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<b>SYSTEM-ON-A-CHIP DESIGN</b>									
Breadth	CG3207 Computer Architecture* Co-list under 'embedded computing'	2	1	1	6	60	4	1 [Evening]	Pre: CG2028/EE2028
	EE3104C Introduction to RF and Microwave Systems & Circuits	3	1	1	5	40%	4	1 [Evening]	Pre: PC2020
	EE3408C Integrated Analog Design	3	1	0	6	40%	4	1	Pre: CG2027/EE2027
Depth	CS4223 Multi-core Architectures Co-list under 'embedded computing' & 'large-scale computing'	2	1	0	3 4		4	1	(CS2106/CG2271) and (CS3210/CS3220/CG3207)
	EE4104 Microwave Circuits & Devices	2.5	0.5	0.5	6.5	45%	4	2	Pre: EE3104C
	EE4112 Radio Frequency Design and Systems	3	1	1.5	4.5	40%	4	1	Pre: EE3104C (or PC2020 subject to approval)
	EE4218 Embedded Hardware System Design Co-list under 'embedded computing' & 'large-scale computing'	2	0.5	1	6.5	60%	4	2	Pre: EE2028/CG2028
	EE4415 Integrated Digital Design Co-list under 'embedded computing'	2	0.5	0.5	7	40% 100%	4	2	Pre: EE2026
	EE4505 Power Semiconductor Devices & ICs Note: Scheduled to offer in alternative years i.e. AY18/19, AY20/21	2	0.5	0.5	7	100%	4	ST1 Not offered in AY21	Pre: Stage 3 standing
EE5518 VLSI Digital Circuit Design <RfP>							4	1	Registration subject to approval

## Note:

- Other level 3000/4000 modules hosted by CS or ECE may be used as fulfilling CEG Technical Elective (TE) requirements (under no particular concentration). Generally, a level 3000 module will count as CEG TE Breadth, while a 4000 level module will count as CEG TE Depth.

- The following level 2000 modules may count as CEG TE Breadth (under no particular concentration):

CS2104 Programming Language Concepts

IE2110 Operation Research I

IE2130 Quality Engineering I (last offer in Sem 2, AY19/20)

- With effect from AY18/19, some EE3xxx modules have been recoded to EE4xxx.

\*CEG students (AY17 – AY20 intakes) are required to read either CG3207 or CS3230 as Programme requirements i.e. only students who passed both modules can count (the other/second) one as TE Breadth.

For CS-coded modules, please refer to LUMINUS for the CA component.

Offer semester and pre-requisites may change; please refer to NUSMods <https://nusmods.com/timetable/>

The host department reserves the right to make final changes to any module on offer.