

3.2.8 Bachelor of Computing in Computer Engineering

Overview

The **Bachelor of Computing (Honours) in Computer Engineering** is a four-year programme offered by the School of Computing since July 2000. It is guided by the insight that designing complex software that satisfies demanding performance constraints constitutes the core technical activity in the engineering of computing systems.

Rapid technological advances have moved computing from the PC into everyday appliances. Due to concomitant advances in communication devices, “computing everywhere” is becoming a reality. A new breed of computer scientists with a deep appreciation of software architectures and their interplay with hardware/communication platforms are needed. The goal of our programme is to provide an integrated view of software-hardware design with an emphasis on topics dealing with the engineering of complex software at various levels. The courses we offer on embedded computing and software engineering are particularly relevant in this context. We intend to graduate computer scientists with a solid foundation in the fundamentals as well as a keen appreciation of engineering software and hardware systems. Such computer scientists will architect the next generation of embedded systems, mobile computing devices, internet appliances, wearable computing and digital entertainment systems.

This programme differs from the Bachelor of Engineering (Honours) in Computer Engineering programme in that the latter is closely related to the electrical engineering degree and its curriculum is designed in accordance with the requirements of the Faculty of Engineering and the Professional Engineers Board. The Bachelor of Computing (Honours) in Computer Engineering programme meets the standard requirements of the four-year Bachelor of Computing in Computer Science and it is structured around the US Association of Computing Machinery (ACM) and the IEEE Computer Society's draft "Computing Curriculum 2001" recommendations. A student pursuing the Bachelor of Computing (Honours) in Computer Engineering degree has tremendous flexibility and opportunity to combine computer science and electrical engineering courses with elective courses from other Faculties such as Business, Arts and Social Sciences, or Science. Furthermore, the School of Computing plans to offer a set of new elective modules on advanced software techniques for embedded systems.

To summarise, the graduates of our programme will be computer scientists with sound hardware knowledge and will possess an excellent skill set and insights relevant for the emerging area of embedded systems. Coupled with the freedom to choose and the availability of the electives, the programme will allow the graduate to position himself/herself in a variety of upcoming and exciting fields of work including:

- Design automation: CAD/CAM tools, hardware-software co-design, next generation firmware, etc.
- Embedded software: software control of systems such as medical instruments, automobiles, airplanes, chemical processing plants, etc.
- Mission critical systems: robotic control, fault tolerant systems, etc.
- Network: wireless application, network management, design and deployment of networks, Internet appliances, WWW development, etc.
- New media: multimedia, design and development of edutainment, digital audio and speech, digital video, etc.
- Ubiquitous systems: smart consumer electronics, defence applications, low-power portable devices, wearable computing, etc.

Degree Requirements

The Computer Engineering programme degree requires at least 160 MCs. Modules are classified as follows (note that every module can only be counted towards satisfying exactly one requirement):

(i) **PROGRAMME REQUIREMENTS (Total of 114 MCs)**

Common Essentials

CS1101 or CS1101S	Programming Methodology
CS1102 or CS1102S	Data Structures and Algorithms
CS1104	Computer Organisation
CS2102S	Database Systems
CS2105	Introduction to Computer Networks

Major Requirements

Computer Science Related

CS1231	Discrete Structures
CS2106	Operating Systems
CS2103	Software Engineering
CS2271	Embedded Systems
CS3211	Parallel and Concurrent Programming
CS3215	Software Engineering Project
CS3220	Computer Architecture
CS3230	Design and Analysis of Algorithms

Either:

CS4101 Honours Project

Or

Complete 12 MCs by taking modules, at level-4000 or above, from the elective areas A1, A2, A3, A4, or A7, with at least one module from A7.

Complete 16 MCs by taking modules from the following CE Programme Elective List.

CE Programme Elective List:

CS3103	Computer Networks and Protocols ⁹
CS3212	Programming Languages
CS4212	Compiler Design
CS4222	Wireless Computing & Sensor Networks

Modules in area A7

Other relevant courses approved by the Department of Computer Science.

Mathematics Related

MA1505	Mathematics I
MA1506	Mathematics II
An ST-coded module on Discrete probabilities ¹⁰	

Electrical Engineering Related

EG1108	Electrical Engineering
EE2006	Digital Design
EE2009	Signals

Others

CS2301	Business and Technical Communication
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(ii) **UNIVERSITY LEVEL REQUIREMENTS**

⁹ Students who take CS3103 (Computer Networks and Protocols) must also take CS3103L (Computer Networks Laboratory)

¹⁰ An ST-coded module on Discrete Probability can be ST1232 (Statistics for Life Sciences) or ST2131 (Probability)

As specified in Section 3.2.1.

(iii) **UNRESTRICTED ELECTIVES**

As specified in Section 3.2.1.

University Scholars Programme (Computer Engineering)

Students in the University Scholars Programme who choose the Bachelor of Computing (Computer Engineering) major will take the Computer Engineering programme, but with the following variations:

1. They will not be required to read University Level Requirements (28 MCs) (These are replaced by appropriate First-Tier Scholars Modules.)
2. They will read UROP modules CS3208 and CS3209 in place of CS3215 (Software Engineering Project). CS3208 and CS3209 are independent study modules (ISMs) and they will also be counted as two of the four Advanced Scholars Modules (8 MCs).
3. They will read modules from the Computer Engineering Elective list to fulfil 110 MCs (instead of 114 MCs) of the major requirement.
4. They will have 10 (instead of 18) MCs under Unrestricted Electives.

Table 8: Summary of degree requirements for Bachelor of Computing (Honours) in Computer Engineering

Modules	MCs	Subtotals
UNIVERSITY LEVEL REQUIREMENTS		28
PROGRAMME REQUIREMENTS		114
<i>Common Essentials</i>		
CS1101/S Programming Methodology	5	
CS1102/S Data Structures and Algorithms	5	
CS1104 Computer Organisation	4	
CS2102S Database Systems	5	
CS2105 Introduction to Computer Networks	4	
<i>Major Requirements</i>		
<i>Computer Science Related</i>		
CS1231 Discrete Structures	4	
CS2106 Operating Systems	4	
CS2103 Software Engineering	4	
CS2271 Embedded Systems	4	
CS3211 Parallel and Concurrent Programming	4	
CS3215 Software Engineering Project	8	
CS3220 Computer Architecture	4	
CS3230 Design and Analysis of Algorithms	4	
Either: CS4101 Honours Project Or Three modules at level-4000 or above, from the elective areas A1, A2, A3, A4, or A7, with at least one module from A7	12	
Modules from CE Elective List	16	
<i>Science Related</i>		
A Discrete Probabilities module	4	
<i>Electrical Engineering Related</i>		
MA1505 Mathematics I	4	
MA1506 Mathematics II	4	
EG1108 Electrical Engineering	3	
EE2006 Digital Design	4	
EE2009 Signals	4	
<i>Others</i>		
CS2301 Business and Technical Communication	4	
UNRESTRICTED ELECTIVES		18
Grand Total		160