4 Computer Engineering

4.1 Introduction

The computer engineering programme is a 4-year Bachelor of Engineering (B.Eng.) programme conducted jointly by the Department of Electrical Engineering (EE) and the School of Computing (SoC). Its main aim is to produce graduates with professional engineering degrees, and who are specialized in both computer hardware and software with general proficiency in the areas of communications, control, microelectronics, software engineering, multimedia, parallel and distributed systems.

The programme is designed such that it will receive accreditation by the Professional Engineering Board (PEB) (Singapore) and the IEE (UK). It is heavily project oriented, and also includes a half-year industrial attachment, and a dissertation based on the final year project. In addition to the final-year project which may focus on either engineering or computer science, the other project requirements consist of two hardware projects in the second year and a software project in the third year. Upon completion of the 4 years of study, a B.Eng. (Comp. Eng.) degree will be awarded with the following classifications:

First Class Honours
Second Class Honours (Upper Division)
Second Class Honours (Lower Division)
Third Class Honours
Pass with Merit
Pass

4.2 Admission Requirements

A candidate who proposes to read Computer Engineering must have good passes in Mathematics, and either Physics or Physical Science at the Singapore-Cambridge G.C.E. Advanced Level Examination. In addition, it is preferred that the candidate has taken Computing or Further Mathematics at the G.C.E. 'A' Level Examination.

4.3 Course Structure

For the Bachelor of Engineering degree in Computer Engineering, a candidate must read at least 41 modules (normally over 8 semesters) consisting of:

24 essential modules
5 elective modules from EE
5 elective modules from SoC
4 essential project modules
3 cross faculty modules
1 human resource management module

1 semester of industrial attachment, and
2 semesters of B. Eng. Dissertation (final year project)

The Computer Engineering modular curriculum is structured to combine strong core curriculums from the Department of EE and SoC. Graduates from this programme will develop key competence in computer hardware and software. The elective modules allow candidates to specialize in areas that interest them and are targeted towards specific job segments. Project modules and thesis prepare them with an in-depth knowledge and practical experience in the computer industry.

(a) Essential Modules

The essential modules from EE and SoC cover the major areas identified in the Computer Engineering Programme and are designed to cater to the needs of the Singapore computer industry. Together, they combine a strong and rigorous conceptual grounding on knowledge in the core subject matter. In addition, they provide ample laboratory sessions to train students in core skills and competence as well as to reinforce the principles learnt.

The list of essential modules is as follows:

Course Code	**Description**	**Pre-requisite/ Co-requisite**
CG1103	Electrical Engineering	-
EG1401	Mathematics A	-
EE1101	Electronics I	CG1103
EE1122	Digital Design Fundamentals	CG1103
EE2102	Electronics II	EE1101
EE2123	Microprocessor Technology	EE1122
EE3202	Microcomputer Systems	EE2123
EG1423	Management and Law	-
EG1501	Sociology	-
CG2401	Mathematics B	EG1401
CG2112	Communications I	EG1401
CG2113	Communications II	CG2113
CS1101C	Programming Methodology	-
CS1102	Algorithms & Data Structures	CS1101C
CS1104	Computer Organization	EE1122 (coread)
CS1301/ CS1231	Discrete Mathematics Discrete Mathematics I	EG1401
EC1310/ EC1311[7]	Principles of Economics/ Microeconomic Analysis	-
CS1304	Accounting	-
CS2102	Introduction to Database Systems	CS1102
CS2103	Software Engineering	CS1101C
CS2105	Computer Networks I	CS1104
CS2106	Operating Systems	CS1101C, CS1104
CS2301	Business and Technical Communication	-
CS3230	Design and Analysis of Algorithms	CS1102
ET1000	English for Computing[8]	-

[7] Students who have passed Economics at A-Level shall read EC1311. All others shall read EC1310.

In addition, there are four essential project modules:

Course Code	Description	Pre-requisite/ Co-requisite
EE2001	Project (analog)	EE2102 (taken only)
CG2001	Hardware Project	EE1122
CG3101	Software Project	*Complete at least 4 regular semesters*
CG4001	B. Eng Dissertation	

(b) Elective Modules

In the third and fourth years, each candidate must read ten modules in the specialized topics provided by the Departments - 5 from EE and 5 from SoC. Of the 5 elective modules from SoC, at most one can be at 5000 level. The elective modules provide the candidate with an in-depth knowledge of study that is targeted towards specific segments of the computer industry.

The list of elective modules are given below:

Course Code	Description	Pre-requisite/ Co-requisite
CG3212	Control Engineering	CG2401
EE3101	Digital Signal Processing Fundamentals	CG2113
EE3203	Real-Time Systems	EE1123 (or equivalent)
EE3302	Industrial Control Systems	CG3212
EE4003	Operation Research & Optimization	CG2401
EE4102	Digital Communications	CG2113
EE4103	Coding Theory	CG2113
EE4108	Telecommunication Systems	CG2113
EE4201	Knowledge Based Systems[9]	-
EE4202	Computer Architecture[10]	EE3202
EE4203	Digital Image Processing	CG2113
EE4204	Computer Networks[11]	EE2112/ CG2112
EE4206	Biomedical Electronics & Systems	-
EE4207	Advanced Digital Systems Design	EE2123
EE4208	Multimedia & web Theory	-
EE4304	Robotics	CG3212
EE4305	Introduction to Fuzzy/Neural Systems[12]	CG3212
EE4307	System Modeling and Simulation[13]	CG3212
EE4405	Quality Control & Reliability	CG2401

[8] This module must be read by students who have not passed or been exempted from the Qualifying English Test at the time of admission to the Computer Engineering Programme. There is no modular unit assigned to this module, but a pass is required for the award of the degree. Please refer to item 1.6 of Chapter 1.
[9] CS3243 and/or CS4244 cannot be taken with EE4201, and vice versa.
[10] A candidate may choose to take either EE4202 or CS3220 but not both.
[11] A candidate may choose to take either EE4204 or CS3103 but not both.
[12] CS3244 and/or CS4242 cannot be taken with EE4305, and vice versa.
[13] A candidate may choose to take EE4307 or CS3232 but not both.

CS3103	Computer Networks II[11]	CS2105
CS3211	Parallel and Concurrent Programming	CS2106
CS3213 or CS3214	System Analysis and Design or Software Engineering Project	CS2103
CS3220	Computer Architecture[10]	CS1104
CS3221	Advanced Operating Systems	CS2106
CS3223	Database Management Systems	CS2102
CS3232	System Modeling and Simulation[13]	CG2401
CS3241	Computer Graphics	CS1102
CS3242	Hypermedia Information Processing	CS2102
CS3243	Foundations of Artificial Intelligence[9]	CS1102
CS3244	Machine Learning and Neural Network[12]	CS3243
CS4211	Advanced Software Engineering	CS3213 or CS3214
CS4221	Database Design	CS2102
CS4222	Adv. Networking: Protocol Design & Impl.	CS3103
CS4231	Parallel and Distributed Algorithms	CS1102, CS2105
CS4232	Performance Analysis of Computer Systems	CG2401
CS4240	Advanced Computer Graphics and Virtual Reality	CS3241
CS4241	Multimedia Information Retrieval	CS3242
CS4242	Reasoning Under Uncertainty[12]	(CS1301 or CS1231), CS3243, CG2401
CS4243	Computer Vision and Pattern Recognition	CS3243
CS4244	Knowledge Based Systems[9]	CS3243
CS5222	Advanced Processor Architecture	
CS5223	Distributed Systems	
CS5224	High Speed Networks and Multimedia Networking	
CS5226	Database Administration and Performance Tuning	

To ensure that the curriculum is progressive and reflects the dynamic world of information technology, other elective modules are being planned and will be made available to students when they are offered.

(c) Cross Faculty Modules

Candidates must read at least three cross faculty modules from outside the Faculty of Engineering and School of Computing. The cross faculty modules ensure that candidates receive a broad-based education. To complement the curriculum, the module cannot overlap with the basic mathematics and computer programming training in the Computer Engineering programme.

(d) Human Resource Management module

The Human Resource Management (HR3102/HR3112) module is a compulsory module for all candidates.

(e) Industrial Attachment

Students will be required to spend one semester in industrial attachment. The attachment will give them a good opportunity to apply what they have learnt at the University in a real-life industrial environment. The experience they gain is invaluable to their future studies at the University and to their careers in the industry. It also enables the students to develop the necessary social, technical and communication skills to work effectively in industry.

(f) B.Eng. Dissertation

Students will have to do a final year project cumulating in a B.Eng dissertation (CG4001) in their final year of study. The projects offered will be relevant to their field of study and will be supervised by staff from EE or SoC or both.

4.4 Degree Requirements

For the Bachelor of Engineering (Comp. Eng.) degree, the candidate must read or be given credit for at least 41 modules, and satisfy the following requirements:

(i) Pass all 24 essential modules.
(ii) Pass 10 elective modules - 5 from EE and 5 from SoC.
(iii) Pass 3 Cross Faculty Modules.
(iv) Pass the human resource management module.
(v) Pass 4 essential project modules
(vi) Participate and pass the industrial attachment project.
(vii) Pass the B. Eng. dissertation project.

4.5 Further Information

For further information, please contact any one of the following:

a) School of Computing Dean's Office, telephone 8742727

b) Department of Electrical Engineering General Office, telephone 8742109

See Section 12 - Appendix C for a complete list of module descriptions.