Briefing
Bachelor of Computing in Information Security 2022/23

A/P Chang Ee-Chien
Joint-Academic-Committee (InfoSec)
BCOMP Information Security


- Cohort intake: Started with 11 students from AY14/15.
  - AY14/15: 11,
  - AY15/16: 16,
  - AY16/17: 26,
  - AY17/18: 43,
  - AY18/19: 70,
  - AY19/20: 54,
  - AY20/21: 67,
  - AY21/22: 40,
  - AY22/23:
Programme Structure
Curriculum

• Cybersecurity is multi-disciplinary
  o System + Management aspects.
  o Domain specific knowledge.

• Provide
  o General breadth \textit{(NUS requirement)}
  o Solid technical background \textit{(Foundation +Core)}
  o In-depth studies in chosen domains \textit{(Elective, FYP)}
  o Industrial Relevance \textit{(Internship, selected modules)}
Degree Requirements

Refer to the official SoC website and NUS Bulletin for complete, up-to-date information.

Currently under “Prospective Students”.  
https://www.comp.nus.edu.sg/programmes/ug/isc/curr/#degree-requirements

It would be shifted to AY 22/23. (not live yet)  

For degree requirements of previous cohort: e.g.  
What a SOC graduate should know

Computing Foundation

Infosec must know

CS breadth/Intern/FYP

Choose what suits you

Read the fine print!
(40): Common Curriculum

Pre-req of almost all computing modules

<table>
<thead>
<tr>
<th>Modules</th>
<th>MCs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common Curriculum Requirements</strong></td>
<td>40</td>
</tr>
<tr>
<td>University Level Requirements &amp; University Pillars</td>
<td>24</td>
</tr>
<tr>
<td>Digital Literacy --- CS1010 Programming Methodology</td>
<td>4</td>
</tr>
<tr>
<td>Critique and Expression --- GEC1%</td>
<td>4</td>
</tr>
<tr>
<td>Cultures and Connections --- GEC1%</td>
<td>4</td>
</tr>
<tr>
<td>Data Literacy --- Either GEA1003, BT1101, ST1131 or DSE1101</td>
<td>4</td>
</tr>
<tr>
<td>Singapore Studies --- GES1%</td>
<td>4</td>
</tr>
<tr>
<td>Communities and Engagement --- GEN1%</td>
<td>4</td>
</tr>
<tr>
<td>Computing Ethics</td>
<td>4</td>
</tr>
<tr>
<td>IS1108 Digital Ethics and Data Privacy</td>
<td>4</td>
</tr>
<tr>
<td><strong>Interdisciplinary &amp; Cross-Disciplinary Education</strong></td>
<td>4</td>
</tr>
<tr>
<td>Comprises of Interdisciplinary (ID) Modules and Cross-disciplinary (CD) Modules</td>
<td>12</td>
</tr>
<tr>
<td>Students are required to take 12 MCs from the above modules with at least two ID modules and no more than one CD module to satisfy the 12 MCs required in this group.</td>
<td></td>
</tr>
</tbody>
</table>
## CORE

- **CS2107 Intro to InfoSec.**
  - Illustrates how system fails. Focus on communication security (basic crypto + network).

- **CS3235 Computer Security.**
  - In-depth. System, Web/mobile. Focus on System security

- **(IFS4103 + CS4238) or (IFS4205)**
  - IFS4103: (Pentesting) Let’s pentest NUS systems
  - CS4236: (Lab) Let’s hack some virtual environment. Attack kill chain.

  - IFS4205: (Capstone Project) Let’s build a security system.

- **IS4231 Infosec Management.**
  - Infeasible to be “perfectly secure”. Let’s manage it.

## ELECTIVES

- **e.g.**
  - CS4239 Software security
  - CS4238 Cryptography
  - IFS4101 Legal Aspect

...
Remarks

• CS3235 (Sys) is the pre-req of many advanced modules. Complete it early.

• CS3230 (Algo) is a core in BCOMP CS but not in InfoSec. Algorithm Analysis is fundamental. Encourage although not core.

• CS2107 (Intro).
  • Previously, students graduated from security-focus diploma could waive CS2017. No waiver for AY21/22 onward.
### Sample Study Plan (AY22/23):

This is a guide for reference, not the “OFFICIAL” recommended plan

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sem 1</strong></td>
<td><strong>Sem 2</strong></td>
<td><strong>Sem 1</strong></td>
<td><strong>Sem 2</strong></td>
</tr>
<tr>
<td>MA1521  Calculus for Computing</td>
<td>MA1101R Linear Algebra</td>
<td>CS2105 Introduction to Computer Network</td>
<td>CS2113T Software Engineering &amp; Object-Oriented Programming</td>
</tr>
<tr>
<td><strong>Breadth Elective 2</strong></td>
<td><strong>Breadth Elective 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Pillar 1) CS1010 Programming Methodology</td>
<td>ST2334 Probability and Statistics or CS2107</td>
<td>CS2106 Introduction to OS</td>
<td>CS2101 Effective Communication for Computing Professionals</td>
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</tr>
<tr>
<td>CS2121S Discrete Structures</td>
<td>CS2100 Computer Organisation</td>
<td>CS2107 Introduction to Information Security or ST2334</td>
<td>CS2235 Computer Security</td>
</tr>
<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td>CS2204C Data Structures and Algorithms</td>
<td>UE 2</td>
<td>InfoSec Elective 1 (CS4238)</td>
<td></td>
</tr>
<tr>
<td>Pillar 4</td>
<td>Pillar 5</td>
<td>Pillar 6</td>
<td>Pillar 7</td>
</tr>
<tr>
<td>20 MCs</td>
<td>24 MCs</td>
<td>24 MCs</td>
<td>16MC</td>
</tr>
</tbody>
</table>

**Footnote**

1. CS1010 is part of ULB
2. Core requirement is (IFS4205) or (CS4238+IFS4203). If taken all 3, (1) CS4238 can be counted as “Breadth elective” or “Infosec elective” or UE, (2) IFS4203 can be counted as infosec electives or UE.
3. IS4231 (only offered once per AY) is on management and could be too abstract when taken too early. Preferably during or after ATAP. Double check that it won’t hinder graduation plan. Currently it is offered in Semester 2. Not recommended to complete it in your last semester.
4. It is possible to take CS2107 earlier in 1st year. However, many feedbacked that it is difficult without knowledge of network. If possible, take it concurrently with CS2105.

**Other Remarks.**

1. Try to clear core as early as possible so as not to disrupt graduation plan.
Many variations/options:

• NOC
• ATAP/SIP/FYP/Start-up/…
• Co-op (MINDEF)
• Double degree, 2nd Major, Minor.
• Exchange
Second Major/Minor

Some options:
• Second Major in Mathematics
• Second Major in Statistics
• Minor in Mathematics
• Minor in Statistics
• Minor in Financial Mathematics
• Minor in Life Science
• Minor in Geography Information Systems
• Minor in Interactive Media Development
• Minor in Management
• Minor in Technopreneurship
• and many others

Co-op (Infosec) & MINDEF work-learn scheme

• This is an option. Not mandatory. Decide near end of Sem 1.
• Takers mostly under NUS-MINDEF work-learn scheme.
• Very low take-up rate for non-MINDEF version, probably due to more restrictions. Regular programme has wider choices on modules, internship and overseas exchange.
Co-operative Education Programme (Infosec)

• Integrates academic studies with relevant work experience.
• Students complete multiple (3) industrial attachment stints alternating with regular academic semesters over their 4-year candidature at NUS.
• Students can expect to work at an attached company for three internships (about 64 weeks or around 16 months).
### A-level intake

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sem 1</strong> (early-Aug~mid-Dec)</td>
<td><strong>Sem 1</strong></td>
<td><strong>Sem 1</strong></td>
<td><strong>Sem 1</strong></td>
</tr>
<tr>
<td>NUS</td>
<td><strong>Sem 2</strong> (Jan ~ early May)</td>
<td><strong>Sem 2</strong></td>
<td><strong>Sem 2</strong></td>
</tr>
<tr>
<td>NUS</td>
<td>Special term (mid-May ~ end-July)</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; internship (~ 24 weeks)</td>
<td>NUS</td>
</tr>
<tr>
<td>NUS</td>
<td><strong>Special term</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; internship (~ 12 weeks)</td>
<td></td>
<td></td>
<td>**3&lt;sup&gt;rd&lt;/sup&gt; internship (~ 28 weeks)</td>
</tr>
<tr>
<td>NUS</td>
<td></td>
<td></td>
<td>NUS</td>
</tr>
</tbody>
</table>

### Poly Intake

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sem 1</strong> (early-Aug~mid-Dec)</td>
<td><strong>Sem 2</strong> (Jan ~ early May)</td>
<td><strong>Sem 1</strong></td>
<td><strong>Sem 1</strong></td>
<td><strong>Sem 1</strong></td>
</tr>
<tr>
<td>Exemption</td>
<td>NUS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NUS</td>
<td>NUS</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; internship (12 weeks)</td>
<td>NUS</td>
<td>NUS</td>
</tr>
<tr>
<td>NUS</td>
<td></td>
<td></td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; internship (~ 24 weeks)</td>
<td></td>
</tr>
<tr>
<td>NUS</td>
<td></td>
<td></td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; internship (~ 28 weeks)</td>
<td>NUS</td>
</tr>
</tbody>
</table>

See Sample Study Plan in Luminus
Students under this scheme would join the same class. This is a special arrangement of co-op programme.
Admin
- Joint Academic Committee (InfoSec)
  - A/P Chang Ee-Chien
  - A/P Roland Yap
  - A/P Setiono Rudy

Enquiry, question: send to SOC Undergraduate Office
socug@comp.nus.edu.sg

The email will be redirected to admin officer in-charge.
Platform for info dissemination

Student in InfoSec will be automatically enrolled into a module OTH881 in LumiNUS. We will disseminate info, conduct survey via that.
Security Cluster

Abhik Roychoudhury
Binary Analysis
Trustworthy Software
Software Security

Chang Ee-Chien
Multimedia Security
Data Privacy
Cloud Security

Divesh Aggarwal
Information Theoretic Cryptography

Sufatrio
System Security

Liang Zhenkai
Binary hardening
System Security

Norman Hugh Anderson
Hardware Security

Prateek Saxena
System Security Data Protection
Fintech

Reza Shokri
Computer Security & Privacy

Roland Yap
System Security
Cloud Computing
Programming Languages

Xiao Xiaokui
Privacy

Prashant Nalini Vasudevan
Cryptography, Complexity theory
Other Researchers ...

- **Stephane Bressan**
  - Data Anonymization

- **Chan Mun Choon**
  - Network Security

- **Xiao Xiaokui**
  - Data Privacy

- **Terence Sim**
  - Face Recognition, Biometric Security

- **Rahul Jain**
  - Quantum Cryptography, Algorithms

- **Yu Haifeng**
  - Distributed Computing, Sybil Attacks

- **Tan Kian Lee**
  - Database Security & Data Privacy

- **Dong Jinsong**
  - Formal Method, Security Protocol Analysis

- **Mohan Kankanhalli**
  - Image/Video Security & Privacy

- **Harold Soh**
  - Human Behaviour
Student Achievements


• Andrea Thniah. *Team member. 1st place at the Elevate Tech Jam Hackathon, Toronto*, 2019.


• Lee Yu Choy, Yeo Chen Hong, *Team member. 3rd place in Open Category, Cyber Defenders Discovery Camp 2018*.

• Jeremy Heng, *AiSP Cybersecurity Award (Student Category)*, 2018.


…

*Note: These are awards that I’m aware of. Many students are too shy to inform me about their achievement.*
NUS Bug Bounty Hall of Fame 2019

The NUS Bug Bounty Programme is an initiative that empowers our students to discover and report security vulnerabilities on our applications and systems. Through this, we aim to bridge the cyber security skill gap and improve the overall IT security posture in NUS. The programme was inaugurated by NUS IT in 2019, in partnership with HackerOne and NUS School of Computing.

During the Bug Bounty challenge in Aug 2019, there were 9 winners awarded a total of USD6,050 and elected into the NUS Hall of Fame.

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Vulnerability</th>
<th>Bounty (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BELLANTE ARMANDO (kagai)</td>
<td>Remote Code Execution x 2</td>
<td>$3,000</td>
</tr>
<tr>
<td>2</td>
<td>AHN TAEYU (silenthath)</td>
<td>Information Disclosure (x2), Reflected Cross Site Scripting (x1)</td>
<td>$1,500</td>
</tr>
<tr>
<td>3</td>
<td>NGO WEI LIN (creaselity)</td>
<td>Information Disclosure (x1) Security Misconfiguration (X1)</td>
<td>$500</td>
</tr>
<tr>
<td>4</td>
<td>MIKOLAJ TAMANAI (stalemcm11)</td>
<td>Reflected Cross Site Scripting x 1</td>
<td>$250</td>
</tr>
<tr>
<td>5</td>
<td>MARILYN CHIU MIN XIUAN (muffi90)</td>
<td>Improper Authentication x 1</td>
<td>$250</td>
</tr>
<tr>
<td>6</td>
<td>KOH ZHENG WEI (shabban)</td>
<td>Improper Authentication x 1</td>
<td>$250</td>
</tr>
<tr>
<td>7</td>
<td>KINGSTON QIAN JUN XIANG</td>
<td>Information Disclosure x 1</td>
<td>$100</td>
</tr>
<tr>
<td>8</td>
<td>DIPTY OJHA</td>
<td>Improper Authentication x 1</td>
<td>$100</td>
</tr>
<tr>
<td>9</td>
<td>LIU SU (ethanyz)</td>
<td>Improper Authentication x 1</td>
<td>$100</td>
</tr>
</tbody>
</table>

SPECIAL CONTRIBUTIONS
The following issues were uncovered by NUS Greyhats and/or School of Computing Students (as part of penetration testing modules).

<table>
<thead>
<tr>
<th>No</th>
<th>Profile</th>
<th>Vulnerability</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ngo Wei Lin, Lee Yu Choy, Glencos Tan Yu Xin, Tan Quan-Rong Kaiser</td>
<td>Information Disclosure (x2)</td>
<td>Medium</td>
</tr>
</tbody>
</table>
Advise & suggestions

• Prepare for the “culture-shock”:
  - Different emphasis. The math are different!
  - Classmates are academically strong!

• Be openminded.

• Learn how to learn.

• Cybersecurity is multidisciplinary.

• We are the good guy.
With great power comes great responsibility.
Thank You!

Q&A

Let’s secure the cyberworld