Briefing
Bachelor of Computing in Information Security
2024/25

Joint-Academic-Committee (InfoSec)
BCOMP Information Security

  • Started with 11 students from AY14/15.

• Some cohorts:
  • AY14/15: 11,
  • AY15/16: 16,
  • ...  
  • AY20/21: 67,
  • AY21/22: 40,
  • AY22/23: 43  
  • AY23/24: 61
InfoSec

• Why InfoSec (Information Security) aka CyberSecurity?
  • “Defence Against the Dark Arts”
    • “73.3% of respondents in Singapore reported experiencing at least one cyberattack in the past year”
  • Opportunities (https://www.weforum.org/agenda/2024/04/cybersecurity-industry-talent-shortage-new-report)
    • WE Forum: “global talent shortage, which spans nations states and industries, could reach 85 million workers by 2030, causing approximately $8.5 trillion in unrealized annual revenue”
  • Challenging & Fun
    • 29K CVEs in 2023
    • Always new attacks / defences / settings
Programme Structure
Curriculum

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

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

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

2024/2025 Cohort:


Choose your cohort.

Information Security Cohort 2024/2025

Overview

The Bachelor of Computing in Information Security aims to:

• To provide a broad-based, inter-disciplinary information security undergraduate programme within NUS.
• To contribute to the national focus on growing the pool of cyber security professionals in Singapore.
• To produce graduates who are able to understand information security issues and practices from both technical and organisational points of view.

Graduates of this programme are expected to have possible career choices as software engineers, systems administrators, malware researchers, security analyst, cybersecurity incident responder, and security consultant. They are expected to find employment in industries that deal with sensitive information (e.g., banks, insurance, defence), government organisations, and firms that provide security consultation/systems/services.
### Summary of degree requirement for Bachelor of Computing in Information Security

<table>
<thead>
<tr>
<th>Course</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computing Foundation</td>
<td>16</td>
</tr>
<tr>
<td>CS breadth/Intern/FYP</td>
<td>28</td>
</tr>
<tr>
<td>Common Curriculum</td>
<td>40</td>
</tr>
<tr>
<td>Infosec requirement</td>
<td>12</td>
</tr>
<tr>
<td>CS/Intern</td>
<td>12</td>
</tr>
<tr>
<td>Unrestrictive UE</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
</tr>
</tbody>
</table>

From https://www.comp.nus.edu.sg/cug/per-cohort/isc/isc-24-25

Read the fine print!
Summary of degree requirement for Bachelor of Computing in Information Security

<table>
<thead>
<tr>
<th>Courses</th>
<th>Units</th>
<th>Subtotals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMMON CURRICULUM REQUIREMENTS</strong></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>University Level Requirements: 6 University Pillars</td>
<td></td>
<td>24</td>
</tr>
<tr>
<td>Digital Literacy — CS1010 Programming Methodology</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Critique and Expression — GEX%</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Cultures and Connections — GEC%</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Data Literacy — Either GEA1000, BT1101, ST1131 or DSE1101</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Singapore Studies — GES%</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Communities and Engagement — GEN%</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Computer Ethics</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>IS1108 Digital Ethics and Data Privacy</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td><strong>Interdisciplinary &amp; Cross-Disciplinary Education</strong></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Comprises of <a href="#">Interdisciplinary (ID) courses</a> and <a href="#">Cross-disciplinary (CD) courses</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students are required to take 12 units from the above courses with at least two ID courses and no more than one CD course to satisfy the 12 units required in this group.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PROGRAMME REQUIREMENTS</strong></td>
<td></td>
<td>84</td>
</tr>
</tbody>
</table>

CS1010 is a pre-req of most Computing Courses
Communities and Engagement

- Communities and Engagement — GEN%

- One of the Pillars under Common Curriculum
- Communities and Engagement courses (coded as GEN%) may be semester or Year long (see below)
- [https://www.nus.edu.sg/registrar/academic-information-policies/undergraduate-students/general-education/communities-and-engagement-pillar](https://www.nus.edu.sg/registrar/academic-information-policies/undergraduate-students/general-education/communities-and-engagement-pillar)
- Issues: semester-long GEN courses have limited capacity per semester — alternative is year-long GEN course (i.e. service learning), students planning for enrichment programmes (Student Exchange Prog (SEP), NOC and/or internships) may need to take year-long GEN option — recommend not leaving the GEN course too late, see diagram
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.
    - Possible to do both IFS4103 + CS4238 + IFS4205 (in principle)

- **IS4231 Infosec Management.**
  - Not just software. Let’s manage it.

ELECTIVES

e.g.

- **CS4239** Software security
- **CS4238** Cryptography
- **IFS4101** Legal Aspects

...
Unrestricted Electives

• UE – may need to consider what other CS / InfoSec courses you want
  • E.g. CS2102 Database Systems
    • Not pre-req but useful for practical security such as pentesting (IFS4103)
  • CS3230 Design and Analysis of Algorithms
    • Needed for CS4230 Foundations of Modern Cryptography
FYP + UROP

• CP4101 BComp Dissertation (FYP)
  • Individual (possible to be small group) project
  • Nature: Research or substantial Development
  • Can be used to as to satisfy CP requirements in lieu of internship (matches 12 units of Computing (CP) requirement)
    • Students with GPA of 4.00 or higher at the end of their fifth semester of undergraduate study may opt to replace the Industry Experience Requirement by BComp Dissertation
  • Students who aim for Honours (Highest Distinction) must pass the CP4101 BComp Dissertation
• UROP (CP3209): for students interested in exploring research (note: 8 units)
Remarks

- CS2107 (Intro) is the first InfoSec course. Needed for CS3235

- CS3235 (System Sec) is the pre-req of many advanced courses. Complete it early.

- CS3230 (Algo) is a core in BCOMP CS but not in InfoSec. Algorithm Analysis is fundamental. Encourage although not core. CS4230 requires CS3230

- CS2107 (Intro).
  - Previously, students graduated from security-focus diploma could waive CS2017. No waiver for AY21/22 onward.
### Sample Study Plan (AY24/25):

This is a guide for reference, not the “OFFICIAL” recommended plan (many possibilities)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sem 1</td>
<td>Sem 2</td>
<td>Sem 1</td>
<td>Sem 2</td>
</tr>
<tr>
<td>MA1521 Calculus</td>
<td>MA1522 Linear Algebra</td>
<td>CS2030 Program. 2</td>
<td>CS2103T S/W Engineering + CS2101 Effective Comm.</td>
</tr>
<tr>
<td><strong>Pillar 1</strong> CS1010 ¹ Program. 1</td>
<td>ST2334 Probability OR CS2107 ²</td>
<td>CS2107 Intro to InfoSec OR ST2334</td>
<td>IFS4205 ² Capstone Project (8 units)</td>
</tr>
<tr>
<td><strong>Pillar 2</strong></td>
<td>CS2040C Data Struct.</td>
<td>CS2105 Network</td>
<td>Pillar 3</td>
</tr>
<tr>
<td>CC 1</td>
<td>UE 1</td>
<td>CC 2</td>
<td>Pillar 4</td>
</tr>
<tr>
<td>UE 6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 units</td>
<td>20 units</td>
<td>24 units</td>
<td>20 units</td>
</tr>
</tbody>
</table>

**Footnote**

1. CS1010 is a Pillar (part of ULR)
2. Core requirement is (IFS4205) or (CS4238+IFS4203). If take all 3, can use as InfoSec Elective or UE.
3. IS4231 (only offered once per AY) is on management and some (work) experience is useful. 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, more difficult without Network knowledge. 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 (only 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
• [https://www.nus.edu.sg/registrar/academic-information-policies/undergraduate-students/special-programmes/minor-programmes](https://www.nus.edu.sg/registrar/academic-information-policies/undergraduate-students/special-programmes/minor-programmes)
Co-op (Infosec) & MINDEF work-learn scheme

- This is only for students in NUS-MINDEF work-learn scheme.
- Other Co-op not available
Admin
• Joint Academic Committee (InfoSec)
  • A/P Roland Yap
  • A/P Liang Zhenkai

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

The email will be redirected to admin officer in-charge.
Security Cluster

Abhik Roychoudhury
Binary Analysis
Trustworthy Software
Software Security

Chang Ee-Chien
Multimedia Security
Data Privacy
Cloud Security

Divesh Aggarwal
Information Theoretic Cryptography

Liang Zhenkai
Binary hardening
System Security

Xiao Xiaokui
Privacy

Prashant Nalini Vasudevan
Cryptography, Complexity theory

Zhang Jiaheng
Cryptography, Blockchain, ML

Prateek Saxena
System Security Data Protection
Fintech

Reza Shokri
Computer Security & Privacy

Roland Yap
System Security
Cloud Computing
Programming Languages

Sufatrio
System Security
Other Researchers ...

- Stephane Bressan - Data Anonymization
- Chan Mun Choon - Network Security
- Xiao Xiaokui - Data Privacy
- Harold Soh - Human Behaviour
- Terence Sim - Face Recognition, Biometric Security
- Rahul Jain - Quantum Cryptography, Algorithms
- Yh 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
Student Achievements
• **Fan Yuting.** *NUS Outstanding Undergraduate Researcher Prize*, 2020.

• **Ngo Wei Lin.** *Team member.  2nd Place in 10th Singapore Cyber Conquest (SCC), 2019.*

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

• **Ahn Tae Gyu & Ngo Wei Lin.** *Obtained prizes from NUS bug bounty, 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.**

• **Jeremy Heng,**  *Team member.  1st place, Singapore Cyber Conquest, 2018.*

...
## 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 USD6,000 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 ARIMANDU (ikaga1)</td>
<td>Remote Code Execution x 2</td>
<td>$3,000</td>
</tr>
<tr>
<td>2</td>
<td>AHN TAEYU (letm3through)</td>
<td>Information Disclosure (x2), Reflected Cross Site Scripting (x1)</td>
<td>$1,500</td>
</tr>
<tr>
<td>3</td>
<td>NGO WEI LIN (creadery)</td>
<td>Information Disclosure (x1) Security Misconfiguration (X1)</td>
<td>$500</td>
</tr>
<tr>
<td>4</td>
<td>MIKOLAJ PANANA (sollamari11)</td>
<td>Reflected Cross Site Scripting x 1</td>
<td>$250</td>
</tr>
<tr>
<td>5</td>
<td>MARILYN CHUA MIN XUAN (muffned)</td>
<td>Improper Authentication x 1</td>
<td>$250</td>
</tr>
<tr>
<td>6</td>
<td>KOH ZHENG WEI (dahhila)</td>
<td>Improper Authentication x 1</td>
<td>$250</td>
</tr>
<tr>
<td>7</td>
<td>KINGSTON KUAN JIN 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 (eltrmpty)</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 Ching, Glencie Tan Yu Xin, Tan Quan Rong Kaiser</td>
<td>Information Disclosure (x2)</td>
<td>Medium</td>
</tr>
</tbody>
</table>


**note: all infosec students.**
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 guys.
Thank You!
Q&A

Let’s secure the cyberworld