Bachelor of Computing In
Information Security

Programme:
- Intro by Prof Chang Ee-Chien
- Student Speaker by Felix Halim
- NUS Greyhats Representative Daniel Lim Wee Soong
- Curriculum by Prof Chang EC
- Q&A

- Please check your audio settings.
- Your microphone is muted with video switched off by default upon joining the webinar session.
- You may post your questions via the webinar during the Q&A segment. The most “voted” ones will be answered first.
- This session will be recorded. If you choose to participate in this webinar, you are presumed to have given your consent of your video/audio text comments in these recordings and the recordings will be shared.
About Speaker

Felix Halim

🎓 Year 3 Information Security

📧 felixh@comp.nus.edu.sg

🔗 linkedin.com/in/halimfelix
Student Activities

NUS Greyhats  🍼

- Participation in CTF
- Internal Trainings
- System Building
- Infosec Related hobbies

Are you ready?

contact@nusgreyhats.org

Slides introducing CTF and NUS Greyhats

https://docs.google.com/presentation/d/1VR6vC9pmU1ShKOefYN8oj1kWxQomH2qBhCneb4Nky2s/edit?usp=sharing
Briefing
Bachelor of Computing in Information Security 2021/22

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


• Started with 11 students from AY14/15.
• 11, 16, 26, 43, 70, 54, 67, 40
Programme Structure
Curriculum

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

• Provide
  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.

https://www.comp.nus.edu.sg/cugresource/per-cohort/isc/isc-21-22/

For degree requirements of previous cohort: e.g.
http://www.comp.nus.edu.sg/cugresource/per-cohort/isc/isc-17-18/
From: https://www.comp.nus.edu.sg/programmes/ug/isc/curr/

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>(24)</td>
<td>ULR</td>
<td></td>
</tr>
<tr>
<td>(36)</td>
<td>Foundation</td>
<td></td>
</tr>
<tr>
<td>(12)</td>
<td>Math</td>
<td></td>
</tr>
<tr>
<td>(20)</td>
<td>Infosec Core</td>
<td></td>
</tr>
<tr>
<td>(12)</td>
<td>Infosec Elective</td>
<td></td>
</tr>
<tr>
<td>(8)</td>
<td>CS Breath</td>
<td></td>
</tr>
<tr>
<td>(12)</td>
<td>Intern/FYP</td>
<td></td>
</tr>
<tr>
<td>(28)</td>
<td>Unrestrictive UE</td>
<td></td>
</tr>
</tbody>
</table>

### Computing Foundation

- **ULR**: ULRA
- **Foundation**: Foundation
- **Math**: Math
- **Communication**: Communication
- **Infosec Core**: Infosec Core
- **Infosec Elective**: Infosec Elective
- **CS Breath**: CS Breath
- **Intern/FYP**: Intern/FYP
- **Unrestrictive UE**: Unrestrictive UE

Choose what suits you

What a graduate should know

Computing Foundation

Security Core

In-depth in chosen topics

Industrial/research experience

Read the fine print!
## 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

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*Treat these two as a single overloaded first module in security*
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. **Recommended** although not core.

• CS2107 (Intro).
  • Previously, students graduated from security-focus diploma could waive CS2017. No wavier for AY21/22 onward.
  • We recently revised CS2107 (intro)+CS3235(sys)+CS4236(crypto). New version of CS2107 contains more components in crypto and security formulation.
## CS vs Infosec

<table>
<thead>
<tr>
<th>CS</th>
<th>InfoSec</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1101S / CS2040</td>
<td>CS1010 / CS2040C</td>
<td>In C++ instead of Java</td>
</tr>
<tr>
<td>CS2030, CS2103T</td>
<td>CS2113T</td>
<td>Combined SE and OOP</td>
</tr>
<tr>
<td>ES2660</td>
<td>IS3103</td>
<td>IS Leadership &amp; Communication</td>
</tr>
<tr>
<td>CS3230</td>
<td>CS2102</td>
<td>Database replaces Algorithms</td>
</tr>
<tr>
<td>SoftEng Project</td>
<td>InfoSec Project</td>
<td></td>
</tr>
<tr>
<td>CS Electives</td>
<td>InfoSec Core + Electives</td>
<td></td>
</tr>
<tr>
<td>1 Sci Module</td>
<td>2 SoC Electives</td>
<td>Any CP/IS/CS coded modules</td>
</tr>
</tbody>
</table>
### Sample Study Plan (AY21/22):

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

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</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>
<td><strong>Sem 1</strong></td>
</tr>
<tr>
<td>MA1521 Calculus for Computing</td>
<td>MA1101R Linear Algebra I</td>
<td>CS2105 Introduction to Computer Network</td>
<td>CS2113T Software Engineering &amp; Object-Oriented Programming</td>
<td>CS2102 Database Systems</td>
</tr>
<tr>
<td>CS1010 Programming Methodology</td>
<td>ST2334 Probability and Statistics</td>
<td>CS2106 Introduction to OS</td>
<td>IS3103 Information Systems Leadership and Communication</td>
<td></td>
</tr>
<tr>
<td>IS1103 Ethics in Computing</td>
<td>CS2040C Data Structures and Algorithms</td>
<td>UE (2MC)</td>
<td>UE (2MC)</td>
<td>UE (2MC)</td>
</tr>
<tr>
<td>UE (2MC)</td>
<td>ULR3</td>
<td>ULR5</td>
<td>ULR1</td>
<td>ULR2</td>
</tr>
<tr>
<td>22 MCs</td>
<td>22 MCs</td>
<td>20 MCs</td>
<td>22 MCs</td>
<td>20MC</td>
</tr>
</tbody>
</table>

- **Remarks:**
  - core requirement (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.
  - Try to clear CORE as early as possible so as not to disrupt graduation plan.
  - IS4231 (only offered once per AY) is on management and could be too abstract when taken too early. Preferably after ATAP. Double check that it won't hinder graduation plan.
  - 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.

*listed in Luminus “OTH881”*
Many variations/options:

- NOC
- Co-op
- Internship
- Double degree, 2nd Major, Minor.
- Exchange
Second Major/Minor

Some interesting 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)

This is an option. Not mandatory. Have to decide near end of Sem 1.
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>Sem 1 (early-Aug~mid-Dec)</td>
<td>Sem 2 (Jan~early May)</td>
<td>Special term (mid-May~end July)</td>
<td>Sem 1</td>
</tr>
<tr>
<td>NUS</td>
<td>1st internship (~12 weeks)</td>
<td>NUS</td>
<td>2nd internship (~24 weeks)</td>
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## 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>
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</thead>
<tbody>
<tr>
<td>Sem 1 (early-Aug~mid-Dec)</td>
<td>Sem 2 (Jan~early May)</td>
<td>Special term</td>
<td>Sem 1</td>
<td>Sem 2</td>
</tr>
<tr>
<td>Exemption</td>
<td>NUS</td>
<td>NUS</td>
<td>1st internship (12 weeks)</td>
<td>NUS</td>
</tr>
</tbody>
</table>

See Sample Study Plan in Luminus
<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 S</strong></td>
<td><strong>Sem 1</strong></td>
</tr>
<tr>
<td>MA1521 Calculus</td>
<td>MA1101R Linear A</td>
<td>CS2113T SW Eng</td>
<td>CS2101</td>
</tr>
<tr>
<td>CS1010 Programming</td>
<td>CS2107 Intro</td>
<td>CS2106 OS</td>
<td>IS3103 Leadership</td>
</tr>
<tr>
<td>CS1231S Discrete</td>
<td>CS2100 C. Organ</td>
<td>CS2105 Network</td>
<td>InfoSec Elective 1</td>
</tr>
<tr>
<td>IS1103 Ethics in Computing</td>
<td>CS2040C Data S. Algo</td>
<td>CS2102 Database</td>
<td>Breadth Elective 1</td>
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<tr>
<td>UE(2MC)</td>
<td>ST2334 Stat</td>
<td>ULR</td>
<td>ULR</td>
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<tr>
<td>ULR</td>
<td>Prep workshop + Placement</td>
<td>ULR</td>
<td>ULR</td>
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<tr>
<td><strong>22 MCs</strong></td>
<td><strong>20 MCs</strong></td>
<td><strong>6 MCs</strong></td>
<td><strong>24 MCs</strong></td>
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<tr>
<td></td>
<td>Year 2</td>
<td>Year 3</td>
<td>Year 4</td>
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<td><strong>Sem S</strong></td>
<td><strong>Sem 1</strong></td>
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<tr>
<td>MA1521 Calculus</td>
<td>MA1101R Linear A</td>
<td>CS2113T SW Eng + IS3103 Leadership</td>
<td>CS3235 C.Security</td>
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<tr>
<td>CS1010 Programming</td>
<td>CS2107 Intro</td>
<td>CS2106 OS</td>
<td>InfoSec Elective 1</td>
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<tr>
<td>CS1231S Discrete</td>
<td>CS2100 C. Organ</td>
<td>CS2105 Network</td>
<td>InfoSec Elective 2</td>
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<td>IS1103 Ethics in Computing</td>
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<td>ST2334 Stat</td>
<td>CS2102 Database</td>
<td>ULR4</td>
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<tr>
<td></td>
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**ULR1** to **ULR6**
Timeline in 1st year for Co-op

Semester 1

~July 2021: Submit Application form

Early Jan 2022: Students to be informed if they can continue in the programme

End of Jan 2022: apply internship via TalentConnect Interviews.
End of Feb 2022: Companies convey decisions.

Early Mar 2022: Students accept offer.
End Mar 2022: Placement finalized

Special term

First internship
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 Undergradaute 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

Guo Charng Rang
Trusted System Vetting
Cryptography

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

Sufatrio
System Security

Xiao Xiaokui
Privacy
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

- **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
Research Centers

NCL
National Cybersecurity R&D Lab

Shared infrastructure, resources & platform of interactions for cybersecurity R&D community

Enhancing capabilities for the next-gen Managed Security Service Provider
- Security Data analytics
- Security-as-a-Service in Cloud
- IoT
- Future-ready technology

NUS-Singtel Corporate Lab in Cybersecurity

A seamless platform for engagement between industry, government and IHLs in the area of information security in Singapore

SGCSC
Singapore Cybersecurity Consortium

N-CRiPT
NUS Centre for Research in Privacy Technologies

Towards a privacy-aware Smart Nation
The goal is to develop privacy-preserving technologies to protect people's and organisations' privacy in a holistic manner

CRYSTAL
Cryptocurrency Strategy, Techniques, and Algorithms

Providing scientific clarity in shaping technical ideas in the blockchain and cryptocurrency space
Student Activity and Selected Students’ profiles
• **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.*

…

*Note: These are awards that I’m aware of. Many students are too shy to inform me about their achievement.*
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.*
Thank You!

Q&A

Let’s secure the cyberworld