

Information Security Degree Programme @ SoC

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School of Computing, NUS

Information Security

- aka
 - Cyber Security
 - Computer Security
 - **InfoSec** – I will just use InfoSec in this talk

Worldwide Impact of Security Vulnerabilities

19 Jul 2024

sky Sky News 
news @SkyNews · Follow

Watch live: Massive IT outage around the world with Sky News affected.
Follow live updates: trib.al/By5V2Ih



Watch on X

BREAKING NEWS Mass IT outage affects global travel & GP surgeries

sky news.com | FTSE 8148.44 | violent disorder in Leeds and "further arrests will be made over the next

1d ago / 5:17 PM GMT+8

Share (

US transportation, police and hospital systems stricken by global CrowdStrike IT outage

US wakes up to Microsoft system collapse from software update that has crippled world IT systems

House cybersecurity member says airlines have ordered a "global ground stop"



Patrick Smith Patrick Smith is a London-based editor and reporter for NBC News Digital.

Three major U.S. airlines, United, American and Delta, have all ordered global ground stops, according to a senior Democratic member of the House Cybersecurity Committee.

Mobile Guardian cyber-security breach

MOE to remove Mobile Guardian app from all students' devices after global cyber-security breach

UPDATED AUG 05, 2024, 11:23 PM ▾



SINGAPORE – The Mobile Guardian app will be removed from all students' personal learning devices, after a global cyber-security breach affected 13,000 students from 26 secondary schools in Singapore.

In a statement on Aug 5, the Ministry of Education (MOE) said the app will be removed from all iPads and Chromebooks as a precautionary measure, and that efforts are under way to safely restore these devices for normal use.

Mobile Guardian is a device management app that helps parents manage their children's device use, restricting screen time and access to specific websites and apps.

Mobile Guardian is a MDM (Mobile Device Management) allowing remote Management of devices available on iOS, Android, ...

Necessity – Major Incidents

- **2018 SingHealth**
 - 27 June-4 July: Data Breach, 1.5 million SingHealth patients data leaked
- **2011 Sony Playstation Network** - cyberattack exposed 77M users
- **2016 Dao Hack** siphon \$50M (ethereum)
- **2017 NotPetya** Ransomware took down world shipping @Maersk, costs \$250-\$300M (est.)
- **2021 Colonial Pipeline** (oil pipeline in SE US), ransomware attack halted all ops
 - regional emergency declaration for 17 states and Washington, D.C
 - largest cyberattack on oil infrastructure target in US
- **2024 Jun 24 Indonesia National Data Centre** attack
 - disrupted many public services (immigration & airport), ≥ 4 days
- **2024 Jul 19 CrowdStrike** (*Falcon* endpoint detection)
 - update of bad config file crashed Windows running Falcon worldwide, major disruption mainly enterprises, airlines

Apple Released iOS 26.5.2 Security Fixes Early to Thwart AI-Assisted Hacks

Monday June 29, 2026 2:14 pm PDT by [Juli Clover](#)

<https://www.macrumors.com/2026/06/29/apple-ios-26-5-2-early-release/>

Apple told [Reuters](#) that it released the updates earlier than planned due to concerns about AI-assisted hacks.

“ *The company told Reuters on Monday it was adapting to the reality that, given the ability of artificial intelligence to speed the development of malicious hacking tools, it needed to reduce the time between when updates were first made public and when they were put into customers' hands.*

Vulnerability fixes are typically included in most Apple software updates, but its major point updates usually include more fixes. Apple intended to release the 25+ security fixes that it introduced today in iOS 26.6 and its sister updates, but didn't want to wait for iOS 26.6 to come out.

InfoSec

- **Why InfoSec?**

- **Necessity** (<https://securitybrief.asia/story/singapore-faces-high-ot-cyberattack-frequency-report-warns>)
 - *“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**
 - 40K CVEs in 2024 (28K in 2023)
 - Always new attacks / defences / settings
 - new scenarios: privacy, AI, ...

A Peek

- How do I make system **X** secure? e.g. X = *web server*
- How hacking works?
 - *not Hollywood*
- How do I keep my data secret?
- Is Bitcoin (or cryptocurrency X) safe?
- How do I publish data but have individual privacy?
- Can my program/app/server be hacked?

- **Difference with CS (Computer Science)?**
 - InfoSec sub-discipline in CS but has **additional aspects** outside CS

BComp Information Security Degree Programme

- Introduced in 2015. Enhanced and replaced *Specialisation in Information Security*.
- For students whose **main interest** is **InfoSec** / aiming to be **InfoSec professional**
- Core is CS + many InfoSec requirements

InfoSec Degree Programme

- Cybersecurity is **multi-disciplinary**
 - System + Management aspects.
 - Domain specific knowledge.
 - Theory + Principles + Practice
 - Courses are CS*, IFS*, IS*

- Provide
 - General breadth *(NUS requirement)*
 - Solid technical background *(Foundation +Core)*
 - In-depth studies in chosen domains *(Elective, FYP)*
 - Industrial Relevance *(Internship, selected modules)*

InfoSec Degree Requirements

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

2026/2027 Cohort:

<https://www.comp.nus.edu.sg/cug/per-cohort/isc/isc-26-27>

Choose your cohort. ...

[Home](#) » [Current Undergraduate Students](#) » [Degree Requirements per Cohort](#) » [ISC](#) » [ISC 2026/2027](#)

Information Security Cohort 2026/2027

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.

COMMON CURRICULUM REQUIREMENTS ¹		40
University Level Requirements: 6 University Pillars		24
Digital Literacy – CS1010 Programming Methodology		4
Critique and Expression – GEN%		4
Cultures and Connections – GEN%		4
Data Literacy – Either GEA1000, BT1101, ST1131 or DSA1101		4
Singapore Studies – GEN%		4
Communities and Engagement – GEN%		4
Computer Ethics		4
IS1108 Digital and AI Ethics		4
Interdisciplinary & Cross-Disciplinary Education		12
Comprises of Interdisciplinary (ID) courses and Cross-disciplinary (CD) courses		
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.		
PROGRAMME REQUIREMENTS		84
Note that at least 80% of the unit requirements in a Bachelor programme's major (i.e. programme requirements) must be at level 1000 to 4000.		
Computing Foundation		32
CS1231S Discrete Structures		4
CS2030 Programming Methodology II		4
CS2040C Data Structures and Algorithms		4
CS2100 Computer Organisation		4
CS2101 Effective Communication for Computing Professionals and CS2103T Software Engineering ²		8
CS2105 Introduction to Computer Networks		4
CS2106 Introduction to Operating Systems		4
Information Security Requirements		28
CS2107 Introduction to Information Security		4
CS3235 Computer Security		4
Either #S4205 Information Security Capstone Project or (CS4238 Computer Security Practice and #S4103 Penetration Testing Practice)		8
IS4231 Information Security Management		4
Programme Electives		8
Complete 8 units from the following list of courses: CS4230 Foundational of Modern Cryptography Either CS4236 Cryptography Theory and Practice, or MA4261 Coding and Cryptography CS4238 Computer Security Practice CS4239 Software Security CS4257 Algorithmic Foundations of Privacy CS4276 IoT Security CS5231 Systems Security CS5321 Network Security CS5302 Database Security CS5331 Web Security CS5302 Biometric Authentication #S4101 Legal Aspects of Information Security #S4102 Digital Forensics #S4103 Penetration Testing Practice #S4204 IT Governance IS4231 Legal Aspects of Information Technology IS4234 Governance, Regulation, and Compliance Technology IS4238 Strategic Cybersecurity IS4202 Blockchain and Distributed Ledger Technologies Other courses at level 4000 or above approved by the School of Computing UG Office		
Computing Requirements		12
Complete 12 units of CS-coded, IS-coded, or CP-coded courses subject to the following conditions:		12
<ul style="list-style-type: none"> CS-coded and IS-coded courses must be at level 3000 or above. At least 6 units must consist of industrial experience courses. The industry experience courses are as follows:		
<ul style="list-style-type: none"> A 6-month internship through CP3880 Advanced Technology Attachment Programme (12 units), IS4010 Digital Transformation Leadership Programme (12 units), or TR2022 Start-up Internship Programme (12 units); A 3-month internships through one of the followings: CP3200 Internship II (6 units), CP3202 Internship II (6 units), CP3107 Computing for Voluntary Welfare Organisations II (6 units), CP3110 Computing for Voluntary Welfare Organisations II (6 units); Other forms of industry experience approved by the Department of Computer Science. 		
Mathematics		12
MA1521 Calculus for Computing		4
MA1522 Linear Algebra for Computing		4
ST2334 Probability and Statistics ³		4
UNRESTRICTED ELECTIVES ⁴		36
Grand Total		160

(40): Common Curriculum

What a NUS (SoC) graduate should know

(32): Foundation

Computing Foundation

(12): Math

(28): Infosec requirement

Infosec must know

(12): CS/Intern

CS breadth/Intern/FYP

(36): Unrestrictive UE

Choose what suits you

160 Units (total)

Read the fine print!



Summary of degree requirement for Bachelor of Computing in Information Security

Courses	Units	Subtotals
COMMON CURRICULUM REQUIREMENTS ¹		40
University Level Requirements: 6 University Pillars	24	
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Critique and Expression — GEX%	4	
Cultures and Connections — GEC%	4	
Data Literacy — Either GEA1000, BT1101, ST1131 or DSE1101	4	
Singapore Studies — GES%	4	
Communities and Engagement — GEN%	4	
Computer Ethics	4	
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CS1010 is a pre-req of most Computing Courses

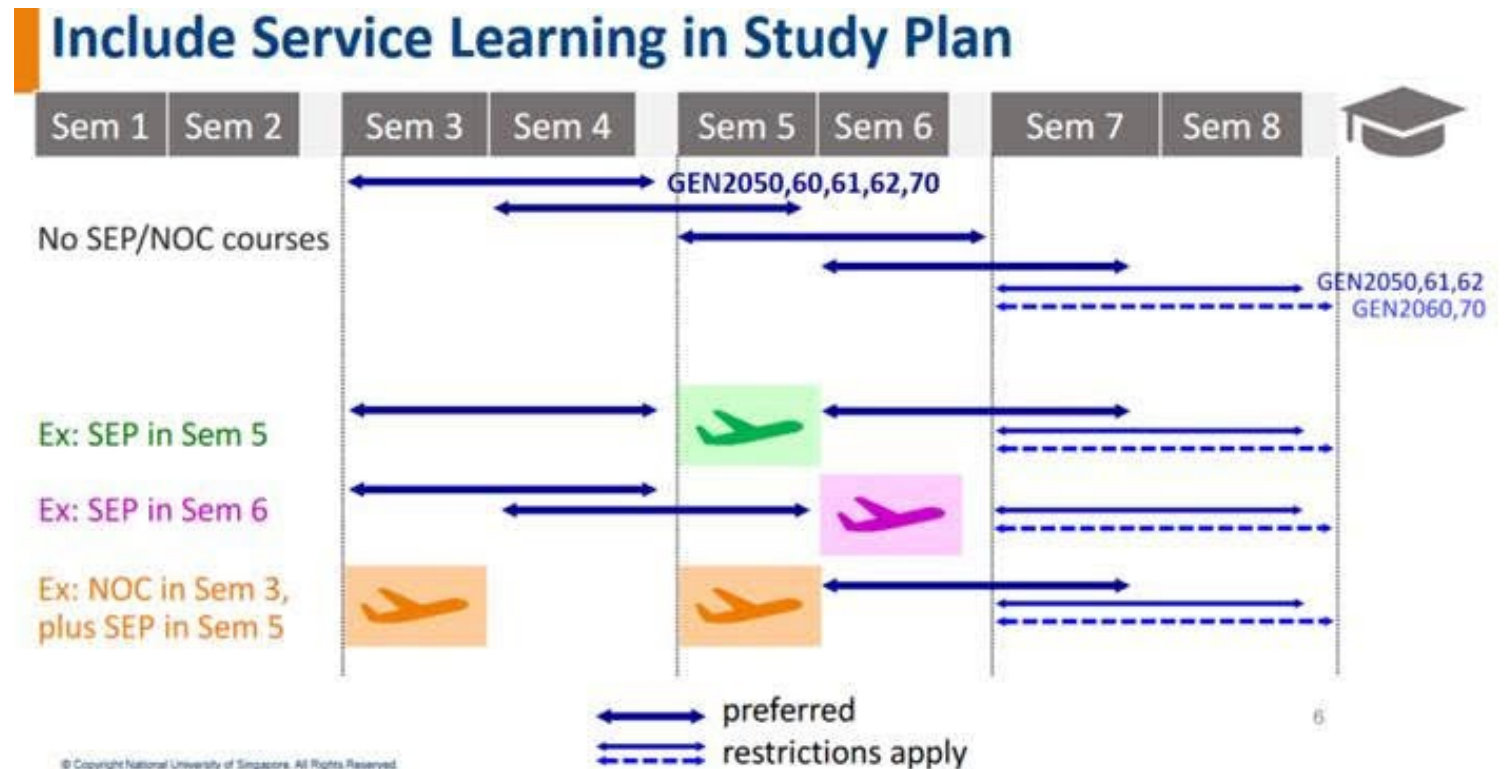
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GEN%Courses

Communities and Engagement

- **Communities and Engagement — GEN%**
 - One of the **Pillars** under **Common Curriculum** (<https://www.comp.nus.edu.sg/cug/soc-22-23/>)
 - 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>
 - 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
 - CS4238: (Lab) Let's hack (within lab)
 - IFS4205: (Capstone Project) Let's build a security system / secure system.
 - Possible to do both IFS4103 + CS4238 + IFS4205 (in principle)

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

ELECTIVES

e.g.

Treat these two as a single overloaded first course in security

CS4239 Software Security

CS4238 Computer Security Practice

IFS4101 Legal Aspects

...

Unrestricted Electives & Dependencies

- 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 – InfoSec Research / Projects

- 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)

Examples of InfoSec Undergraduate Research

- some of my UROP / FYP students
- UROP
 - NUS Outstanding Undergraduate Researcher Prize
 - G.J. Duck, [Y. Zhang](#), R. Yap, Hardening binaries against more memory errors, EuroSys 2022
- FYP
 - investigates how good are disassemblers in practice
 - L. Wijayadi, Y. Jiang, R. Yap, Z. Liang, [Zhuohao Liu](#), AsiaCCS 2025

Course Planning 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

Many variations/options:

- NOC
- ATAP/SIP/FYP/Start-up/...
- NUS-MINDEF Cyber NSF
- 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>

Security Profs



Abhik Roychoudhury
Binary Analysis
Trustworthy Software
Software Security



Liang Zhenkai
Binary hardening
System Security



Prateek Saxena
System Security Data
Protection
Fintech



Chang Ee-Chien
Multimedia Security
Data Privacy
Cloud Security



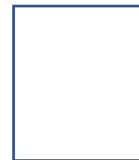
Xiao Xiaokui
Privacy



Reza Shokri
Computer Security &
Privacy



Divesh Aggarwal
Information Theoretic
Cryptography



**Prashant Nalini
Vasdudevan**
Cryptography, Complexity
theory

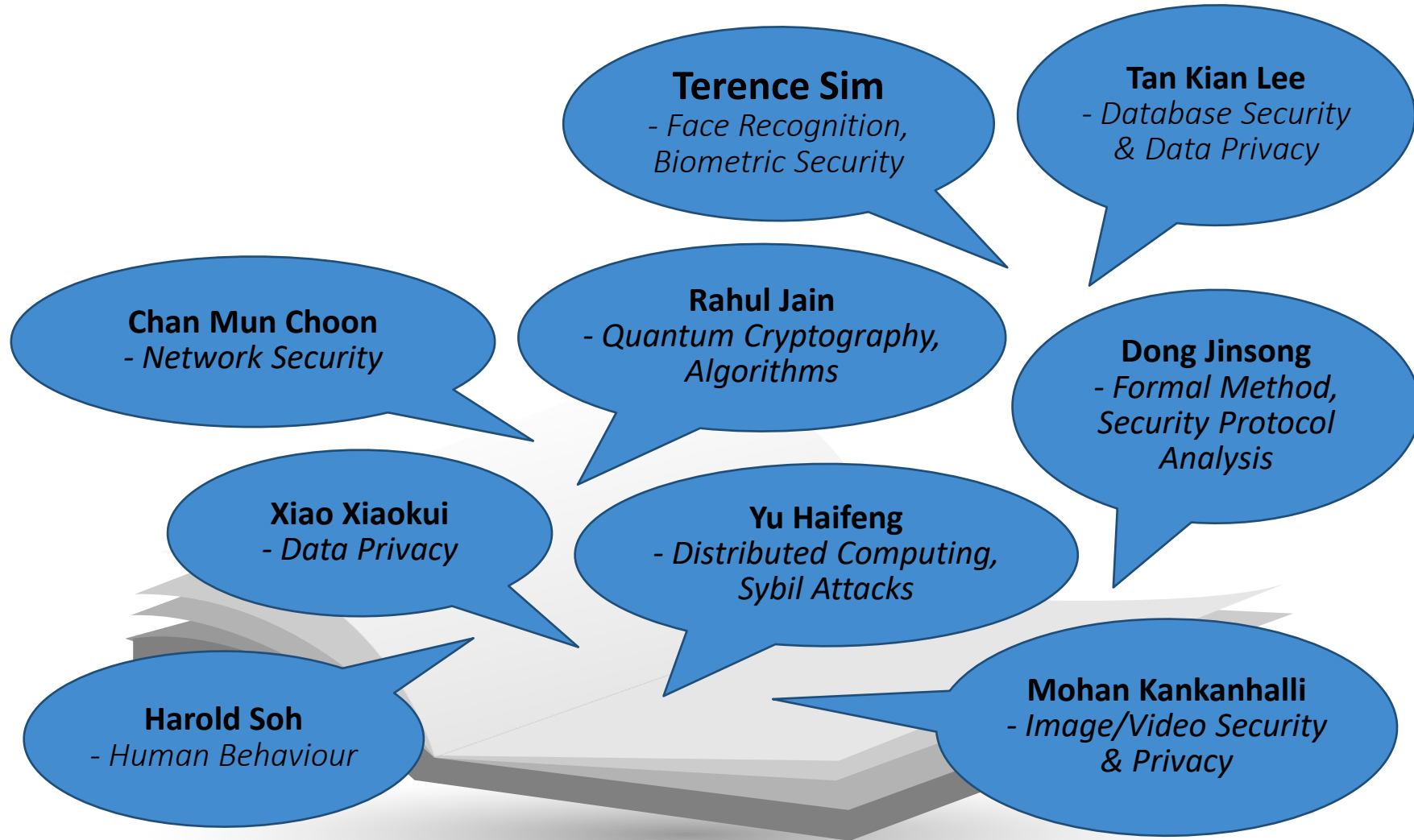


Roland Yap
System Security
Cloud Computing
Programming Languages



Zhang Jiaheng
Cryptography,
Blockchain, ML

Other Profs ...



Student Activity and Selected Alumni profiles

Glenice Tan

- Enrolled in 2016.
- End of Year 1 – Intern at CSA.
Penetration Testing. (Credited as SIP)
- End of Year 3 – Intern at GovTech.
Red teaming.
- Exchange at National Chiao Tung University (NCTU), Taiwan.
- Final Year Project. Evasive Malwares
- Graduated with Honours (Highest Distinction) in 2020.
- Joined GovTech.

• Activities

- CTF in Romania with NUS Greyhats in 2017.
- Teaching Assistant. *CS2107, (2018-2020)*
- NUS Greyhats, *Core Team Member*
- ISACA Student Chapter, *President*
- USP Mentorship Programme, *Peer Mentor*
- Dean's List (2019).
- LIT Hackakaton (2019), *First runner-up & Special Recognition*
- Hack and Roll (2019), *Most Annoying Hack.*
- Code Xtreme Apps (2018), *Second Runner-up.*
- Junior Defenders Camp (2017), *Second Runner-up*
- Cyber Defenders Discovery Camp (2017), *Silver*
- iMDA iPrep (2017), *participant.*



Jeremy W.M. Heng

- Enrolled in 2015.
- Summer 2016 - Intern at DSO
- Summer 2017, 2018 – Intern at Apple Inc. San Francisco
- Graduated in 2020, Honours (Distinction)
- Joined Apple Information Security, San Francisco as Security Engineer.

• Activities

- NUS Greyhats, Core Member
- DEFCON Singapore Group (DC65), Founder
- Singapore Cybersecurity Awards, Student Category, 2018
- ASEAN Cyber SEA Games, 2nd Place (Team Singapore), 2017
- Amazon MicroCTF Bsidess Las Vegas, Champion, 2016
- Singapore Cyber Conquest Championship, Champion, 2017
- Singapore Cyber Conquest Championship, Champion, 2016,
- CVE-2017-15587, CVE-2017-14994, CVE-2017-7687, CVE-2017-9790
- Nandy Narwhals Security Blog, Author.
- Involved in organizing: CrossCTF 2017, NUS Grehyats X-CTF 2017, NUS Greyhats CTF101 Workshop,

...



Advice & Suggestions

- Prepare for the “**culture-shock**”:
 - Different emphasis. The maths is different!
 - Classmates are academically strong!
 - Deal with the **Real World**
- Be openminded.
- Learn how to learn.

- **Cybersecurity is multidisciplinary.**
- ***We are the good guys.***



We are *white hats*!

Thank You!

Q&A



Let's secure the cyberworld

