Master 2 Cybersecurity
Cryptology & Security; Informatics & cyber-physical systems

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http://cybersecurity.imag.fr
September 21, 2020
M2 CyberSecurity (CS)

1 year dedicated program at Université Grenoble Alpes (UGA)

Ensimag + UFR IM²AG

cybersecurity.imag.fr application from Jan. (FSA)

- **Goals**: formation of experts in security and coding technologies
  - **Cryptology**: mathematical primitives and protocols (RSA, AES, ECC, SHA3, PKI…)
  - **Security**: software/hardware (network, system, integration), audit
  - **Applications**: watermarking, multimedia, smartcard, …

- **M2 P+R**: Directed to Research and Industry
  - Sept.-Jan.: lectures + training
  - Feb.-Sept.: project / internship
# CyberSecurity courses

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**Group:** Advanced Cryptology

**Group:** Advanced Security

**Internship** (within a Company or in a research unit) | 30 | S10
Research environment

• Cybersecurity: versatile domain, within different departments
  – Computer science + Mathematics
  – LIG, LJK, Institut Fourier, Verimag, TIMA, GIPSA-Lab, Inria, CEA
  (all these Grenoble research units « labs » are involved in the courses)

• Complementary aspects:
  – Academia + Industry + Government
  – Many research projects (French ANR, MinDef, Europe, etc.)

• An Idex project « Grenoble Alpes Cybersecurity Institute »
  – Federate Security activities in Grenoble between science and humanities
An already long history

- Security, Cryptology and Coding of Information Master – 2002 - 2016: about 400 students
- Becomes Cybersecurity in 2016
- Total over 500 graduates ...
Examples of Master thesis/PFE

- **Integration of zero-knowledge authentication on smart card** [C-S]
  - Secure server for SIP telecommunications [INRIA]
  - Integration of strong authentication in an information system [British Telecom]
  - Management of identity for printer access [Helwett-Packard, Germany]
  - Reconfiguration of a secure infrastructure [France-Telecom, Grenoble]

- **Conception et réalisation d’un composant de sécurité** [Ministère Défense, Paris]
  - Analysis and deployment of a confidential data service [Solucom, Nantes]
  - Integration of biometrics in crypto protocols [SAGEM, Paris]

- **Hidden channel attacks** [SAGEM, Paris]
  - Windows CardSpace components in a smart card [Gemalto, La Ciotat]
  - Secure loading of jar in JavaCard3.0 [Gemalto, La Ciotat]
  - Lightweight electronic signature [Dictao, Paris]
  - Wireless infrastructure for emergency comm. [Wisecomm, Germany]
  - Secure and anonymous communication on internet [UL, Luxembourg]
  - Test of crypto-secure random generators [LTSI, Lyon]

- **Security analysis of a medical data protection scheme** [Philips, Eindhoven]
  - Supervision of the CEA computer infrastructure [CEA, Grenoble]
  - Security analysis of images watermarking [GIPSA, Grenoble]
  - Security audit of the SCADA platform [Atos Origin, Grenoble]

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Partners

- Thales
- Actoll
- Ernst & Young
- ST Micro
- Amadeus
- Sopra group
- Logica
- Solucom
- Accenture
- MinDef
- Tessi lab
- C-S
- EADS
- Technicolor
- CEA LETI
- Xerox
- Tiempo
- Orange Labs (Caen, Arcueil, Rennes, Paris, Grenoble)
- Netheos
- Medasys infrastructure
- CGI
- Sogeti High Tech
- Mathworks
- Consensys
- Deloitte
- Police scientifique
- Oberthur
- Cap Gemini
- Schneider Electric
- Canal+ Technologies (Nagra)
- Netasq SA
- Aatlantide
- Gemalto
- Banque de France
- Atos
- SFR
- Onix
- Edelweb
- Prowebce
- Microstore
- Aliantiz
- Airbus
- DCNS
- Caisse d’épargne
- Motorola
- Laboratoires CNRS, INRIA, Universities
- ...

…
IT skills shortage

In which of the following areas do you believe your IT organization currently has a problematic shortage of existing skills? (Percent of respondents, N=627, multiple responses accepted)

- Cybersecurity: 46%
- Mobile application development: 37%
- Business intelligence/data analytics: 36%
- Social media/marketing technologies: 34%
- Enterprise mobility management: 31%
- Server virtualization/private cloud infrastructure: 31%
- Compliance management, monitoring and reporting: 30%
- Social enterprise/collaboration technologies: 30%
- IT architecture/planning: 30%
- Application development: 28%
- Data protection: 27%
- Database administration: 25%
- Help desk/service desk: 24%
- Storage administration: 24%
- Server administration: 22%
- Network administration: 22%
- We do not have any IT skills shortages: 12%
- Other: 1%
- Don’t know: 2%

Career growth potential

In which of the following functional areas do you believe skills development would be most beneficial to your employees (i.e., IT staff) in terms of their career path and benefit to your organization? (Percent of respondents, N=627)

- Infrastructure management, 17%
- Application development and deployment, 12%
- Big data analytics, 26%
- Cybersecurity (i.e., information security), 44%

Examples of PhD

- **Nicolas Bordes**
  2017: M2 CyberSecurity
  2018-20...: PhD Grenoble LJK [Karpman, Dumas]
  **Symmetric primitives of low multiplicative complexity, side channel attacks and masking**

- **Alexandre Berzati**
  2007: M2 SCCI
  **Analyse cryptographique des altérations d'algorithmes**
  2010: Postdoc CEA Cadarache
  Since 2011: **Engineer expert INVIA** [Semiconductor design for embedded security]

- **Thomas Roche**
  2006: M2 SCCI
  **Dimensionnement et intégration d'un chiffre symétrique (...)**
  2010-2011: Postdoc Paris-8
  Since 2011: **ANSSI** (Agence nationale de la sécurité des systèmes d'information), then **APPLE**

Also

• ADE: planning

• Calendar: Sept. - Jan. + holidays

• Regulations (in French):
  – Course ≈ 50% Exam + 50% Practice/Interrogations
  – Practice / Interrogations mandatory (ABJ 0/20, ABI DEF)
  – Average 10/20, for each semester
  – No course below 7/20
  – FLE (Français langue étrangère) is proposed
  – Internship: 5 to 6 months

Master 2 = Semesters 9 & 10

• Welcome week: Sept. 16 to 18, 2020
  – Foreign students welcome, administrative registration, training

• Semester 9: 14 weeks
  – Part 1: 7 weeks from Sept. 21 to Nov. 13 (first week refresh)
  – Part 2: 7 weeks from Nov. 16 to Jan. 15 (group option start, last week = catch-up slots)

• Exams: Jan 18 - 22, 2021
  – 2nd session: April 2021

• Semester 10: Internship
  – Internship defenses: September 1 – Sept. 6, 2021
  ➔ Start now to look for one
Semester 9: 14 weeks
Advanced Cryptology/Security

• Course with choice
• Starts November 21st 2020

Pierre Karpman / Cédric Lauradoux

- Shared Plenary courses (CM)
- Elective lab (TP) and practical sessions (TD)
Some Events

• **FEEL:** *Thursday Oct. 8th, 2020*

• GreHack 2020: **Friday Nov. 20th, 2020**
  – [https://grehack.fr](https://grehack.fr)


• Forum int. de la Cybersécurité: **Jan 19-21th, 2021**
  – [www.forum-fic.com](http://www.forum-fic.com) (Lille)
Registrations

• From **Wednesday September 16th, 2020**
  – Registration UGA / INP
  – Use your [@univ-grenoble-alpes.fr](mailto:@univ-grenoble-alpes.fr) and [@grenoble-inp.org](mailto:@grenoble-inp.org) addresses

• Master mention, choice of:
  – Informatique (Computer science)
  – Mathématiques & applications