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

UGA directors: Jean-Guillaume Dumas, Vanessa Vitse
Ensimag director: Marie-Laure Potet

http://talnetsolutions.com
M2 CyberSecurity (CS)

1 year dedicated program at University Grenoble Alpes (UGA)

Ensimag + ufr IM²AG
cybersecurity.imag.fr

Goals: formation of experts in security and coding technologies

- Cryptology: mathematical protocols (RSA, AES, ECC, SHA3, PKI…)
- Security: software/hardware (network, system, integration), audit
- Applications: watermarking, multimedia, smartcard, …

M2 P+R: Directed to research and profession

- Sept.-Jan.: lectures+training
- Jan.-Sept.: project/internship
## CyberSecurity courses

<table>
<thead>
<tr>
<th>Contents</th>
<th>Credits</th>
<th>Sem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software security, secure programming and <strong>computer forensic</strong></td>
<td>3</td>
<td>S9</td>
</tr>
<tr>
<td><strong>Security architectures</strong>: network, system, key managements, cybersecurity of industrial IT</td>
<td>6</td>
<td>S9</td>
</tr>
<tr>
<td>Cryptographic engineering, <strong>protocols and security models</strong>, data privacy, coding and applications</td>
<td>6</td>
<td>S9</td>
</tr>
<tr>
<td>Threat and risk analysis, IT security <strong>audit</strong> and norms</td>
<td>3</td>
<td>S9</td>
</tr>
<tr>
<td>Hardware and <strong>embedded</strong> systems <strong>security</strong></td>
<td>6</td>
<td>S9</td>
</tr>
<tr>
<td><strong>Optional</strong>: <strong>Advanced Cryptology</strong></td>
<td>6</td>
<td>S9</td>
</tr>
<tr>
<td><strong>Optional</strong>: <strong>Advanced Security</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Internship</strong> (within a Company or in a research unit)</td>
<td>30</td>
<td>S10</td>
</tr>
<tr>
<td>+ FLE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 » participate in the courses)

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

- A Labex Persyval team
  - SCCyPHy « Security and Cryptology for CyberPhysical systems »
  - Federate Security activities in Grenoble
Following SCCI

• Security, Cryptology and Coding of Information Master
  – 2002 → 2016: about 500 students

• Becomes Cybersecurity
  – From 2016
**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]

...
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, Grenoble)
- Netheos
- Medasys infrastructure
- CGI
- Mathworks
- 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%

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)

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

*Source: Enterprise Strategy Group, 2016.*
Examples of PhD

**Sébastien Varrette**
2003: M2 SCCI
2003-2007: PhD Grenoble (LIG-Inria [Roch]) & Univ. Luxembourg [Leprévost]
**Security in Large Scale Distributed Systems: Authentication and Result Checking**
Since 2007: **Research fellow Université Luxembourg** [Distributed Platforms Security and HPC systems]

**Alexandre Berzati**
2007: M2 SCCI
**Analyse cryptographique des altérations d'algorithms**
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 is proposed
  – Internship: 4 to 6 months

Master 2 = Semesters 9 & 10

• Semester 9: 14 weeks
  – Part 1: 7 weeks from Sept. 18 to Nov. 10
  – Part 2: 7 weeks from Nov. 13 to Jan. 12

• Exams: Jan 22 – 26, 2018
  – 2nd session: April/July 2018

• Semester 10: Internship
  – Internship defenses: September 3 – 7, 2018
## September 18 – September 22

<table>
<thead>
<tr>
<th>Time</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Morning</strong></td>
<td>8h00-9h30 &amp; 9h45-11h15</td>
<td>GBCY9U05 Embedded Sec.</td>
<td>GBCY9U03 Crypto Eng.</td>
<td>GBCY9U05 Embedded Sec.</td>
<td>GBCY9U03 Crypto Eng.</td>
</tr>
<tr>
<td></td>
<td>START</td>
<td>GBCY9U02 Security Arch.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11h30-13h00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Afternoon</strong></td>
<td>14h00-15h30 &amp; 15h30-17h00</td>
<td>GBCY9U02 Security Arch.</td>
<td>REGISTRATION</td>
<td>REX (Ensimag) 21/09 &amp; 28/09</td>
<td>GBCY9U05 Embedded Sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Registration
- **Ensimag**
  - 21/09 & 28/09
September 25 – November 10

6 weeks: from September 18 to November 10
vacances toussaint; Friday November 11, vacation;
Thursday October 12, FEEL

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>RATTRAPAGE</td>
<td>GBCY9U05 Embedded Sec.</td>
<td>GBCY9U05 Embedded Sec.</td>
<td>GBCY9U03 Crypto Eng.</td>
<td>GBCY9U03 Crypto Eng.</td>
</tr>
<tr>
<td>GBCY9U02 Security Arch.</td>
<td>GBCY9U04 Risk Analysis</td>
<td>RATTRAPAGE</td>
<td>RATTRAPAGE</td>
<td>GBCY9U03 Crypto Eng.</td>
</tr>
<tr>
<td>GBCY9U01 Software Security</td>
<td>RATTRAPAGE</td>
<td></td>
<td>GBCY9U03 Crypto Eng.</td>
<td>GBCY9U03 Crypto Eng.</td>
</tr>
<tr>
<td>English (Ing. Ensimag)</td>
<td>GBCY9U01 Software Security</td>
<td>conférences industrielles +</td>
<td>GBCY9U02 Security Arch.</td>
<td>GBCY9U05 Embedded Sec.</td>
</tr>
<tr>
<td>8h00-9h30 &amp; 9h45-11h15</td>
<td></td>
<td>RATTRAPAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11h30-13h00</td>
<td>14h00-15h30 &amp; 15h30-17h00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3h+1.5h Morning

3h Afternoon
# November 13 – December 22

6 weeks
November 17th GreHack

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>8h00-9h30</td>
<td>OPTION:</td>
<td>OPTION:</td>
<td>GBCY9U05</td>
<td>GBCY9U03</td>
</tr>
<tr>
<td>11h30-13h00</td>
<td>RATTRAPAGE</td>
<td>RATTRAPAGE</td>
<td>RATTRAPAGE</td>
<td>RATTRAPAGE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Afternoon</th>
<th>English (Ing. Ensimag)</th>
<th>GBCY9U02 Security Arch.</th>
<th>conférences industrielles + RATTRAPAGE</th>
<th>GBCY9U04 Risk Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>13h45-15h15</td>
<td></td>
<td>GBCY9U02 Security Arch.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15h30-17h00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 1 semaine

<table>
<thead>
<tr>
<th>Jour</th>
<th>Lundi</th>
<th>Mardi</th>
<th>Mercredi</th>
<th>Jeudi</th>
<th>Vendredi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8h00-9h30 &amp; 9h45-11h15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>11h30-13h00</td>
<td>GBCY9U05 Embedded Sec.</td>
<td>RATTRAPAGE</td>
<td>RATTRAPAGE</td>
</tr>
<tr>
<td>Apres-midi</td>
<td>GBCY9U02 Security Arch.</td>
<td>GBCY9U05 Embedded Sec.</td>
<td>GBCY9U03 Crypto Eng.</td>
<td>conferences industrielles + RATTRAPAGE</td>
<td>GBCY9U04 Risk Analysis</td>
</tr>
<tr>
<td></td>
<td>13h45-15h15 &amp; 15h30-17h00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Optional courses

👍 choice before **Sept 30th 2017**.
  – the number of places is limited.
  – [Jean-Guillaume.Dumas@univ-grenoble-alpes.fr](mailto:Jean-Guillaume.Dumas@univ-grenoble-alpes.fr)

• Advanced Cryptology
  – Vanessa Vitse

• Advanced Security
  – Cédric Lauradoux
Some Events

• GreHack 2017: **Friday Nov. 17\textsuperscript{th}, 2017**
  – [https://grehack.fr](https://grehack.fr)

• FEEL: **Thursday Oct. 19\textsuperscript{th}, 2017**

• 2017 Cyber Security Awareness Week in Valence
  – [www.csaw-europe.com](http://www.csaw-europe.com)
  – qualification rounds online
  – on-site competitions (**Nov. 9\textsuperscript{th} to 11\textsuperscript{th} 2017**)

• Forum int. de la Cybersécurité: **Jan 23-24\textsuperscript{th}, 2018**
  – [www.forum-fic.com](http://www.forum-fic.com)

• Forum Emploi-maths: **Dec. 13\textsuperscript{th}, 2017**
Registrations

• **Wednesday September 20th, 2017**
  – 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