

# **IFIP - SIG on Education in Resilient Computing**

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**University of Pisa, Italy**

## Scope of the SIG

To have an open worldwide forum in which the different educational approaches to teaching Resilient Computing are presented, compared and discussed to reach an agreed approach to this issue.

In addition it is very valuable to collect together in a open and public database all available support material (as lecture's slides, textbooks, relevant literature, links to useful sites, etc.) that covers the different facets of multi-disciplinarity.

A first attempt to offer to our community a proposal for an MSc curriculum in Resilient Computing and gather extended support material has been done very recently in the European Network of Excellence ReSIST – Resilience for Survivability in IST <http://www.resist-noe.org/> – run from January 2006 to March 2009.


All information on the proposed MSc curriculum and related courseware is on-line at <http://resist.isti.cnr.it/home.php> and can be used as a first step in the proposed SIG.

## **Aims of the SIG**

The primary aims of the proposed SIG are:

- To acquire knowledge on how Resilient Computing is taught today in different worldwide higher educations institutions;
- To compare the experiences so to provide an incremental process towards the structuring of an educational track in Resilient Computing;
- To promote the outcomes of the SIG to update or change or start proper tracks in Resilient Computing in higher educations institutions;
- To interact with international bodies working on educational issues, IFIP TC 3, ACM, etc., to present the outcomes of the SIG;
- To collect and make accessible, through the web, support material useful to cover the several disciplines relevant to Resilient Computing;
- To build and maintain a comprehensive database of material, available to the community of students, scientists, industrial designers and regulatory bodies.

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Training and dissemination

**MSc Curriculum in Resilient Computing**

MSc Curriculum Organization and ReSIST Courseware material  
Other free available courseware material

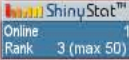
D37 - Resilient Computing Curriculum (text of the deliverable)  
D38 - Resilient Computing Courseware (text of the deliverable)

The material that is in these pages is freely available for lecturing and teaching. ReSIST intends to maintain this site updated; a Steering Committee for this aim is composed by:

Tom Anderson - Newcastle University  
Algirdas Avizienis - Vytautas Magnus University  
Hugh Glaser - University of Southampton  
Jean-Claude Laprie - LAAS-CNRS, Toulouse, France  
Brian Randell - Newcastle University  
Luca Simoncini - University of Pisa

If you know other material relevant to Resilient Computing (personal set of slides, relevant web-sites, etc.) that you wish to share please send a message to Luca Simoncini <luca.simoncini@isti.cnr.it>

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Training and dissemination

**MSc Curriculum organization**

Access to the syllabus, the line of teaching and, where available, to the ReSIST courseware by clicking on the titles of each course.

MSc Curriculum in Resilient Computing

1<sup>st</sup> Year

<p><b>1<sup>st</sup> semester: Basics and Fundamentals (30 ECTS)</b> Courses:</p> <ul style="list-style-type: none"> <li>• Advanced Probability and Statistics (6 ECTS)</li> <li>• Cryptology and Information Security (6 ECTS)</li> <li>• Logic in Computer Science (6 ECTS)</li> <li>• Advanced Graph Theory (3 ECTS)</li> <li>• Human Factors, Human and Organisational Behaviour (3 ECTS)</li> <li>• Fundamentals of Real-Time Systems (3 ECTS)</li> <li>• Fundamentals of Dependability (3 ECTS)</li> </ul>	<p><b>2<sup>nd</sup> semester: Methods, Techniques and Tools (30 ECTS)</b> Courses:</p> <ul style="list-style-type: none"> <li>• Computer Networks Security (6 ECTS)</li> <li>• Resilient Distributed Systems and Algorithms (6 ECTS)</li> <li>• Dependability and Security Evaluation of Computer-based Systems (6 ECTS)</li> <li>• Testing, Verification and Validation (6 ECTS)</li> <li>• Usability and User Centred Design for Dependable and Usable Socio-technical Systems (6 ECTS)</li> </ul>
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Tomatoes are not the only fruit 2005-05

ReSIST Final Review WP3.pdf


WP3\_D28-PAR.doc

WP3\_D28-PAR.incremental.doc

Immagine 1

Immagine 2

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Training and dissemination


**MSc Curriculum in Resilient Computing**

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<p><b>3<sup>rd</sup> semester: Projects (in cooperation with industry on specific application fields) (30 ECTS)</b> Courses (common to all application tracks)</p> <ul style="list-style-type: none"> <li>• Management of Projects (3 ECTS)</li> <li>• Middleware Infrastructures for Application Integration (3 ECTS)</li> <li>• Software Reliability Engineering (3 ECTS)</li> </ul> <p>Application track: <b>Resilience in Communication Networks</b> Courses (specific for this track):</p> <ul style="list-style-type: none"> <li>• IP Networks and Services Resilience (3 ECTS)</li> <li>• Resilience of Mobile Applications (3 ECTS)</li> </ul> <p>Application track: <b>Safety critical Systems</b> Courses (specific for this track):</p> <ul style="list-style-type: none"> <li>• Development Process and Standards for Safety critical Applications (3 ECTS)</li> <li>• Architectural Issues and Examples of Systems (3 ECTS)</li> </ul> <p>Application track: <b>Resilience in e-Business</b> Courses (specific for this track):</p> <ul style="list-style-type: none"> <li>• Enterprise Security (3 ECTS)</li> <li>• Computer and Network Forensics (3 ECTS)</li> </ul> <p>Common to all Application tracks:</p> <ul style="list-style-type: none"> <li>• Project in cooperation with Industry (9 ECTS)</li> <li>• Space for additional Courses (6 ECTS)</li> </ul>	<p><b>4<sup>th</sup> semester: Master's Thesis and Dissertation (30 ECTS)</b></p> <ul style="list-style-type: none"> <li>• Specific Courses and Seminars (3 ECTS)</li> <li>• Preparation and Presentation of the Thesis (27 ECTS)</li> </ul>
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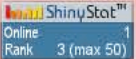
# resist noe

resilience for survivability in IST

## Training and dissemination

**MSc Curriculum in Resilient Computing**

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### Fundamentals of Dependability (3 ECTS)

The purpose of this course is to give a structured introduction to the concepts of dependability and to the methods and techniques used for dependable design of systems and for scaling to complex resilient systems.

**Contents:**

- Basic concepts and definitions
- State of the art from statistics
- Threats to dependability
- Fault removal
- Fault forecasting
- Fault tolerance
- Development of dependable systems
- From dependability to resilience

**Suggested readings:**

J-C. Laprie et al.: **Guide de la sûreté de fonctionnement**, Cepaduès Editions, 1995 (in French).

D. P. Siewiorek and R. Swartz: **Reliable Computer Systems, Design and Evaluation**, Third Edition, A K Peters, Ltd., 1998.

A. Avizienis, J-C. Laprie, B. Randell and C. Landwehr: **Basic Concepts and Taxonomy of Dependable and Secure Computing**, IEEE Trans. On Dependable and Secure Computing, Vol.1, n.1, Jan.-March 2004, pp. 11-33.

J.C. Laprie: **From Dependability to Resilience**, 38th IEEE/IFIP Int. Conf. On Dependable Systems and Networks, Anchorage, Alaska, June 2008, Sup. Vol., pp. G8-G9

[ReSIST Courseware](#) (right click and select "Save as" to download)

**Courseware examples and locations where taught:**



Higher National School of Aeronautics and Space (ENSAE), Toulouse. Jean-Claude Laprie.

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http://resist.isti.cnr.it/files/corsi/courseware\_slides/dependability\_fundamentals.pdf

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# Fundamentals of Dependability

Jean-Claude Laprie




ReSIST courseware — Jean-Claude Laprie — Fundamentals of Dependability

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## Training and dissemination

- Development of dependable systems
- From dependability to resilience

**Suggested readings:**

J-C. Laprie et al.: **Guide de la sûreté de fonctionnement**, Cepadaùs Editions, 1995 (in French).

D. P. Siewiorek and R. Swartz: **Reliable Computer Systems, Design and Evaluation**, Third Edition, A K Peters, Ltd., 1998.

A. Avizienis, J-C. Laprie, B. Randell and C. Landwehr: **Basic Concepts and Taxonomy of Dependable and Secure Computing**, IEEE Trans. On Dependable and Secure Computing, Vol.1, n.1, Jan.-March 2004, pp. 11-33.

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[ReSIST Courseware](#) (right click and select "Save as" to download)

**Courseware examples and locations where taught:**

Higher National School of Aeronautics and Space (ENSAE), Toulouse. Jean-Claude Laprie.

Higher National School of Electronics, Informatics, and Radiocommunications of Bordeaux. Jean-Claude Laprie.

Higher National School of Electrotechnology, Electronics, Informatics, Hydraulics and Telecommunications, Toulouse. Jean-Charles Fabre.

These topics are covered in the MSc-level course on "Fault-tolerant design of computer systems" available at City University as a professional development short course. The slides are not publicly available.

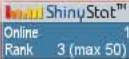
**Line of teaching**

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**Related courses & materials**

**Details**

chapter brings together the previous chapters into the development of dependable systems. The last chapter introduces resilience, in the context of ubiquitous computing systems.

**Coureware Resources:**

- [Fundamentals of Dependability](#)
- [Guide de la sûreté de fonctionnement](#)
- [Reliable Computer Systems, Design and Evaluation, Third Edition](#)
- [Basic Concepts and Taxonomy of Dependable and Secure Computing](#)
- [From Dependability to Resilience](#)

**Detailed Description:**

Basic concepts and definitions. Attributes of, means for, threats to dependability. Primary attributes: reliability, availability, safety, integrity, confidentiality, maintainability. Secondary attributes: robustness, survivability, accountability, authenticity, non-repudiability.

**People**

- Jean-Claude Laprie
- Algirdas Avizienis
- Brian Randell
- Carl Landwehr
- D. P. Siewiorek
- R. Swartz

**Organisations**

- LAAS-CNRS
- Laboratoire d'Analyse et d'Architecture des Systèmes

**Projects**

- ReSIST Resilience for Survivability in IST
- Accompanying Measure System Dependability
- Design for validation
- Network of Excellence in Distributed Computing System Architecture
- Predictably Dependable Computing Systems

**Courses & Materials**

- Dependability of computer systems
- Dependability and Security Evaluation of Computer-based Systems

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**Related publications**

**Details**

**Title:**  
Fundamentals of Dependability

**Author:**  
[Jean-Claude Laprie](#)

**Web Address:**  
[http://resist.isti.cnr.it/files/corsi/courseware\\_slides/d](http://resist.isti.cnr.it/files/corsi/courseware_slides/d)

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**People**

- [Jean-Claude Laprie](#)

**Organisations**

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**Projects**

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- [Design for validation](#)
- [Network of Excellence in Distributed Computing System Architecture](#)
- [Predictably Dependable Computing Systems](#)
- [ReSIST Resilience for Survivability in IST](#)

**Courses & Materials**



- [Fundamentals of Dependability](#)
- [Dependability of computer systems](#)

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# Fundamentals of Dependability

Jean-Claude Laprie



ReSIST courseware — Jean-Claude Laprie — Fundamentals of Dependability

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