

- Faculté des sciences
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## Cloud Computing (3IN2047)

Filières concernées	Nombre d'heures	Validation	Crédits ECTS
<b>Master en informatique</b>	<b>Cours: 2 ph Exercice: 2 ph</b>	<b>écrit: 2 h</b>	<b>5</b>

ph=période hebdomadaire, pg=période globale, j=jour, dj=demi-jour, h=heure, min=minute

### Période d'enseignement:

- Semestre Printemps

### Equipe enseignante:

Lectures: Dr. Etienne Rivière  
Assistant: Aurélien Havet

### Objectifs:

This Cloud Computing course is proposed in the context of the Swiss Joint Master in Computer Science of the Universities of Bern, Neuchâtel and Fribourg (<http://mcs.unibnf.ch>). It targets students with a background in undergraduate distributed systems and operating systems, wishing to get a deep understanding of the concepts, design and implementation of Cloud computing systems. Cloud infrastructures, formed of geographically distributed and very large data centers, power most of today's applications and large company services.

The course covers a range of systems and software engineering aspects at the heart of Cloud computing. Example systems discussed in class are selected from state-of-the-art industry and research systems, and references for further (optional) reading are provided.

### Contenu:

The Cloud Computing course features 10 lectures, 2 tutorials, 2 practical projects and one reading seminar.

#### Topics covered:

- Cloud Computing model and landscape
- Virtualization and isolation
- IaaS management and the Cloud Operating System
- Lightweight virtualization and containers
- Micro-services and RESTful APIs
- Platform-as-a-Service and service-oriented architecture
- Cloud storage
- High availability and geo-replication
- Consistency models and algorithms
- Cloud coordination
- Advanced storage management and deduplication
- Resource allocation: elasticity and energy efficiency
- Cloud security

#### Tutorials:

- Virtualized environments and IaaS
- Containers and Docker

#### Practicals:

- REST service orchestration on the Heroku PaaS
- Cloud coordination using the ZooKeeper service

#### Reading seminar:

- Each student selects one paper from a recent top-level Cloud conference (or related area such as Systems, Networking) and gives a brief presentation during a workshop at the end of the semester.

### Forme de l'évaluation:

The evaluation is on the final exam (40% of the grade), the grades of the project assignments (40% of the grade, with an equal weight for each of the two projects), the grade for the reading seminar presentation (20% of the grade). The deadlines for the two project reports are announced at the first lecture. Upon failure at the exam, the grade for the assignments and for the reading seminar will be kept when the student passes the

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exam another time.

**Documentation:**

No book required. Pointers to online resources (research papers) will be provided in class.

**Pré-requis:**

Ability to program in general-purpose high-level programming languages, such as Python or Ruby. Assistance will be provided for students who do not know these languages. The class requires student to use their own laptops. Students without a laptop should contact the instructor who will seek an arrangement.

**Forme de l'enseignement:**

Lectures, tutorials, practical projects, and reading seminar