Course unit: Actuarial science

** Beware! Under construction. **

Course metadata

- Title in French: Actuariat
- Course code: tba
- Type: specialized course
- ECTS credits: 4
- Semester 10 (Spring)
- Teaching period: Mid-February to Mid-April
- Teaching hours: 100h
- Language of instruction: English
- Coordinator: Renaud Bourlès
- Instructor(s): Mitra Fouladirad, Violaine Conti (AXA), Alban Davand (AXA), Rim Ennajar-Sayadi (AXA), Xavier Guerrault (AXA), Emmanuelle Mimart (AXA), Sofiane Ournidi (AXA), Thérèse Winterholer (AXA), Sitraka Forler (Post Luxembourg), Lirone Samoun (smartpush)
- *Last update 22/05/2026 by C. Pouet*

Course description

The aim of the course is to present the main issues related to pricing of insurance products as well as the recent developments in actuarial sciences related to prudential regulation, disability insurance or long-term care.

Most of the instructors are from the French insurance company Axa. Axa group is the 5th largest insurance company according to Forbes ranking 2025. See full ranking https://beinsure.com/ranking/top-20-largest-insurance-companies-forbes-global/.

The course is divided into three parts:

- **Insurance economics** (24 hours) taught by Renaud Bourlès and Jiakun Zheng,
- ** Actuarial science 1** (24 hours) taught by Mitra Fouladirad and Axa instructors,
- **Actuarial science 2** (24 hours) taught by Axa instructors,
- **Data Project: modeling and validation ** (20 hours) taught by Sitraka Forler and Lirone Samoun.

Learning outcomes

- How to price simple life insurance products
- Understand the accounting specificities of insurance companies
- Know the current issues and the current regulations of the insurance market.

Course content

Insurance economics

Actuarial science 1

1. Introduction to actuarial science
    - The model of life insurance
    - Non-life insurance specificities
2. Non-life insurance products
    - Characteristics of Non life insurance
    - Mechanisms of Non life Insurance
    - Technical Indicators
    - Pricing
    - Reserving

Actuarial science 2

1. Life insurance products
    - Technical and financial margins
    - Fair Value and warranty hedging in life insurance
2. Insurance regulation
    - Valuing an insurance portfolio and its profitability
    - Solvency II : modèle interne, SCR computation, BEL,…
3. Asset-Liability Management in insurance
4. Duration models and experience tables
5. Long-term care risk
6. Reinsurance
7. Accounting standards

Data Project: modeling and validation

1. Projects and models
    - The Bias-Variance tradeoff
    - Feature Selection
    - Feature Engineering
    - Defining a metric
2. Models and applications
    - Regressions (linear, polynomial, penalized and logistic)
    - Decision trees (random forest and gradient boosting)
3. Focus on Natural Language Processing (NLP)

Bibliography

You can check the availability of the books below at Centrale Méditerranée library.

- Tosetti A., Weiss F. et Poncelin T., Les outils de l'actuariat vie, Economica
- Charpentier A. et Dutang C., L'Actuariat avec R

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