Digital Finance (DIFI) — Course Syllabus

FS 2026

Prof. Dr. Joerg Osterrieder

Fachhochschule Graubünden

FS 2026

Course Overview

- BSc elective at Fachhochschule Graubünden, Spring Semester 2026
- **8 modules $\times$ 4 lessons $=$ 32 lessons**
- Problem-based learning: every module answers a real-world financial question
- Blend of theory, data, code, and case studies
- All materials available online — slides, notebooks, quizzes, exercises, demos

Contact: joerg.osterrieder@fhgr.ch

Module Overview

Module	Question	Key Topics
M1	Why do financial services cost so much?	Payments, intermediation, platforms
M2	Who gets access to financial services?	Inclusion, credit scoring, fairness
M3	Can we build trust without intermediaries?	Cryptography, consensus, DeFi
M4	How do we measure and manage risk?	VaR, derivatives, systemic risk
M5	Can machines make financial decisions?	ML, LLMs, MLOps
M6	What powers the financial system?	Rails, core banking, APIs
M7	How do we keep finance safe and fair?	AML, RegTech, model governance
M8	What comes next?	Digital identity, quantum, climate

Each module contains 4 lessons of approximately 25 slides each.

Learning Outcomes

After completing this course, students can...

1. **Analyse** the cost structure of financial services and evaluate FinTech disruption strategies.
2. **Evaluate** financial inclusion barriers and detect algorithmic bias in credit scoring.
3. **Apply** cryptographic primitives, consensus mechanisms, and smart contracts to build trust.
4. **Compute** risk measures (VaR, ES) and price derivatives using quantitative models.
5. **Design** supervised ML pipelines for financial prediction and explain their limitations.
6. **Compare** legacy and next-generation financial infrastructure (APIs, CBDC, embedded finance).
7. **Implement** AML/KYC workflows and assess regulatory frameworks for digital assets.
8. **Synthesise** emerging trends (quantum, climate finance, SSI) into a forward-looking perspective.

Outcomes align with Bloom's taxonomy levels 3–6 (Apply, Analyse, Evaluate, Create).

Prerequisites

- **Python programming** — variables, loops, functions, basic data structures
- **Statistics fundamentals** — mean, variance, normal distribution, hypothesis testing
- **No finance background required** — the course teaches all financial concepts from scratch

Recommended preparation:

- Complete any introductory Python course (e.g. Codecademy, DataCamp)
- Review descriptive statistics (histograms, correlation, regression basics)

All coding exercises run in Google Colab — no local setup needed.

Assessment

Component	Weight	Details
Semester Project	50%	Choose one of 8 module projects
Presentation	20%	15-minute group presentation of project
Quizzes	30%	Multiple-choice, best 6 of 8 modules

- Projects include starter notebooks, rubrics, and sample data
- Quizzes cover 15–20 questions per module (self-assessment available online)
- Minimum grade to pass: 4.0 (Swiss scale 1–6)

Detailed rubrics available in each project folder.

Course Materials

Material	Quantity
Lecture Slides (PDF)	32
Quizzes (PDF)	32
Exercises with Solutions (PDF)	32
Mini-Lectures (PDF)	32
Jupyter Notebooks (Colab)	32
Coding Challenges (Colab)	32
Interactive Demos	8
Course Projects	8
Module Summaries	8
Glossary	180+ terms
Exam Prep Guide	40 questions

All materials at: `https://digital-ai-finance.github.io/digital-finance/v4/`

Academic Integrity

- All submitted work must be your own.
- **AI tools** (ChatGPT, Copilot, Claude) may be used for learning and exploration, but must be disclosed in project submissions.
- **Plagiarism** — copying code or text without attribution results in grade 1.0 for the component.
- **Collaboration** — discussing concepts is encouraged; sharing solutions is not.
- **Quizzes** — individual work, open-book, no communication during the quiz.

When in doubt, ask the instructor before submitting.

FH Graubünden academic integrity policy applies.

Recommended Readings

FinTech & Digital Finance:

- Madura, J. (2021). *Financial Markets and Institutions*, 13th ed., Cengage.
- Chishti, S. & Barberis, J. (2016). *The FinTech Book*, Wiley.

Blockchain & Crypto:

- Narayanan, A. et al. (2016). *Bitcoin and Cryptocurrency Technologies*, Princeton UP.
- Antonopoulos, A. (2017). *Mastering Bitcoin*, 2nd ed., O'Reilly.

AI/ML & Risk:

- James, G. et al. (2023). *An Introduction to Statistical Learning*, 2nd ed., Springer.
- Hull, J. (2022). *Options, Futures, and Other Derivatives*, 11th ed., Pearson.

Additional readings linked in individual lesson slides.