Teaching Portfolio

presented by

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1 Teaching Philosophy

For me, teaching is much more than delivering information or helping students earn high grades. It is about inspiring curiosity, building confidence, and teaching students how to think critically and solve complex problems. A good teacher shares their passion for learning and creates an environment where students feel motivated to explore and engage.

The core Principles of My Teaching Philosophy are :

- **Passion and Preparation**: I believe passion for teaching is essential. When I am enthusiastic about the subject, students feel it too. This passion drives me to prepare thoroughly, organize course materials clearly, and continuously improve based on student feedback.
- **From Memorization to Understanding**: My goal is to help students move beyond memorizing formulas and develop a deeper understanding of concepts. I encourage them to ask questions, participate in discussions, and connect theory to real-world applications. For example, when teaching calculus, I often illustrate its use in modeling physical systems or economic trends.
- **Active and Interactive Learning**: I strive to make classes interactive through problem-solving sessions, group activities, and blended learning techniques such as the flipped classroom. This approach allows students to review materials beforehand and use class time for collaborative exercises and deeper exploration.
- **Relevance and Context**: Students learn best when they understand why a topic matters. I always explain how mathematical concepts apply in professional contexts—whether in engineering, finance, or data analysis—so they see the value of what they are learning.
- **Individual Support and Mentorship**: Every student learns differently. I dedicate office hours to mentoring and supporting students, whether they are highly motivated or struggling. Outside the classroom, I encourage questions and guide students toward solutions rather than giving direct answers, helping them build confidence and independence.
- **Continuous Improvement**: Teaching is an evolving practice. I actively seek feedback on my teaching style, materials, and assignments, and I use this input to refine my methods. I believe openness and honesty foster trust, making students more willing to share constructive feedback.

2 Teaching Methodology

My teaching approach is grounded in clarity, engagement, and adaptability. Over the years, I have integrated modern pedagogical strategies and digital tools to create an interactive and student-centered learning environment. I aim to help students not only master theoretical concepts but also develop practical skills and autonomy. Key Elements of My Approach

- **Flipped Classroom**: I encourage students to take an active role in their learning by reviewing lecture materials and resources before class. This allows classroom time to be dedicated to problem-solving, discussions, and deeper exploration of concepts. I use platforms like Moodle to share videos, notes, and preparatory exercises.
- **Digital Learning Tools**: Technology plays an important role in my teaching. Through Moodle, I create online spaces where students can access course materials, quizzes, and discussion forums. These tools help maintain engagement outside the classroom and provide timely feedback.
- **Real-World Applications and Projects**: I believe mathematics becomes meaningful when students see its relevance. I regularly design projects and case studies inspired by real-world problems—whether in engineering, finance, or environmental modeling. This approach nurtures curiosity, critical thinking, and creativity.
- **Collaborative Learning:** Group work is central to my methodology. Students collaborate on projects, share responsibilities, and learn from each other's perspectives. This not only strengthens teamwork skills but also mirrors professional environments where collaboration is essential.
- **Independent Assignments**: To foster autonomy, I assign individual projects or research-based tasks. These assignments encourage students to explore topics in depth, develop problem-solving strategies, and build confidence in their ability to learn independently.

3 Teaching Experience

I have had a variety of teaching experiences. I have taught undergraduates and graduate students. Below is a summary of my teaching experience

3.1. Professional Training – Fromagerie Henri Hutin (Groupe Hochland)

- Training: Fundamentals of Applied Statistics

Year	Duration	Audience	Instructor
2026	14h	Industrial staff	B. Al Taki

The professional training *"Fundamentals of Applied Statistics"* was designed for industrial teams to strengthen their ability to analyze data and support evidence-based decision-making. The course covered core statistical concepts, including descriptive statistics, probability distributions, hypothesis testing, regression analysis, and basic data visualization, with an emphasis on practical industrial use cases.

Special attention was given to adapting the content to the trainees' prior knowledge and professional context. By the end of the training, participants were able to interpret statistical results, assess variability and uncertainty in data, and apply statistical reasoning to real-world industrial problems.

3.2. Digital Campus-Paris

- Course: Statistical Studies for Marketing (Master 2)

Academic year	Credits	Audience	Course
2024/2025	28h	Master students	B. Al Taki

The course "Études statistiques pour le marketing" aims to equip students with the analytical skills needed to make data-driven marketing decisions. It covers essential statistical techniques, such as hypothesis testing, regression analysis, ANOVA, and data visualization, with a focus on real-world marketing applications. By the end of the course, students will be able to design, execute, and interpret statistical studies to assess marketing strategies, optimize campaigns, and provide actionable business insights.

3.3. EMLV- Leonardo da Vinci School of Management

Academic year	Credits	Audience	Course
2024/2025	15h	Master students	B. Al Taki

The course "Financial Econometrics" introduces master's students to essential econometric tools for analyzing financial data. It covers topics such as asset returns, risk assessment, and statistical modeling, with a strong focus on linear and multiple regression techniques. Through a blend of theoretical foundations and practical applications, the course prepares students to interpret financial markets, apply quantitative methods, and develop the analytical skills required for careers in finance and risk management.

3.4. Leonard de Vinci Engineering School

- Course: Partial Differential Equations PDEs (Third Academic Year)

Academic year	Credits	Attending students	Instructors
2024/2025	15h	Bachelor's level (L3)	D. Yacoubi, B. Al Taki

The course "Partial Differential Equations (PDEs)" introduces students to fundamental PDEs and their applications, focusing on three main types: the heat equation, the wave equation, and the transport equation. Each chapter covers theoretical foundations, solution techniques, and practical implementation through Python-based exercises. With 4.5 hours of tutorials and hands-on Python practice per chapter, the course equips students with the analytical and computational skills necessary to model and solve real-world problems in physics, engineering, and applied mathematics.

- Course: Linear Algebra (Second Academic Year)

Academic year	Credits	Attending students	Instructors
2024/2025	15h	Bachelor's level (L2)	D. Jarossay, B. Al Taki

The course "Linear Algebra" provides a comprehensive study of orthogonality, projections, and transformations in vector spaces. Students explore key topics such as scalar products, orthonormal bases, norms, and symmetric matrices, with a focus on understanding and applying orthogonal projections, symmetries, and distances. The course also delves into advanced concepts like bilinear forms, quadratic forms, isometries, and rotations in 3D. By combining theoretical foundations with practical problem-solving, students develop the mathematical tools essential for applications in geometry, physics, and engineering.

- Course: Numerical Methods (Third Academic Year)

Academic year	Credits	Attending students	Instructors
2024/2025	28h	Bachelor's level (L3)	S. Cohen, B. Al Taki

The course "Numerical Methods" introduces students to essential numerical techniques for solving first-order ordinary differential equations. It covers a range of numerical schemes, including Euler, Taylor, Runge-Kutta, and Adams-Bashforth methods, with a strong emphasis on their implementation and application. Through hands-on practice in Python and theoretical insights, the course equips students with the skills to solve complex mathematical problems, preparing them for advanced studies and applications in science, engineering, and computational fields.

- Course: Introduction to statistics with R (Higher School Preparatory Classes)

Academic year	Credits	Attending students	Instructors
2022/2023	20h	Bachelor's level (L1)	L. Imbert, B. Al Taki

This is an introductory course to statistics: descriptive statistics, maximum likelihood estimation, confidence intervals, and tests, etc. We introduce students to R. Ah the end of this course, students are asked to do a statistics project using the program R.

- Course: Probability (Higher School Preparatory Classes)

Academic year	Credits	Attending students	Instructors
2022/2023	24h	Bachelor's level (L1)	A. Jaghdam, B. Al Taki

This is an introductory course to probability. We approach the following notions: probability space, combinatorial analysis, usual laws of probability, Central Limit Theorem, conditional probability, and independence, etc.

3.5. Sorbonne Université

- Course: Analysis and Algebra for the science (first academic year)

  Academic year: 2019/2020 Credits: 36h

  Attending students: 38 Course: L. Koelben and B. Al Taki

  We approach in this course the various following notions: $\mathbb{R}$: Order and intervals, Limits, Continuity, Derivations, Usual and reciprocal functions, Mean Value theorem, Taylor expansion, First order linear differential equations, The field $\mathbb{C}$ and the complex exponential, Polynomials, Roots, Rational fractions, Euclidean division, $\mathbb{R}^2, \mathbb{R}^3$, Scalar and vector product.

- Course: Vectorial analysis and multiple integrals (second academic year).

  Academic year: 2019/2020 Credits: 32h

  Attending students: 33 Course: F. Paugam and B. Al Taki

  In this course we deal with the following notions: Limits and continuity, Differential, Primitive and integral calculus, Parametric curves, Vector calculus, Partial and differential derivatives, Contour line, Curvilinear integral, Parametric surface, Implicit function theorem, Multiple integrals, Differential forms.

- Course: Introduction to differential equations (second academic year)

  Academic year: 2019/2020 Credits: 24h

  Attending students: 38 Course: C. Boutillier and B. Al Taki

  In this course we discuss the following concepts: Definitions and generalities, Cauchy-Lipschitz statement for first order equations $y' = f(t,y)$, with f globally Lipschitz in the second variable, Scalar first order linear differential equations $x' = px + q$, Matrix exponential, Linear differential equations with constant coefficients (Adaptation of the method of variation of the constant), Phase spaces, Models of population evolution.

- Course: Pre-Calculus (Post PACES of Polytech Sorbonne).

  Academic year: 2017/2018 Credits: 20h

  Attending students: 35 Course: B. Al Taki

  The Peib Post-PACES training of the Polytech network is a training that allows students who have done a first year in medicine without passing the exam afterward, to join the Polytech network in their second year. The reinforcement course that I gave consists of recalling the basic notions of analysis; stating the main theorems of analysis of the first year, and doing some exercises as applications.

- Course: Calculus I (first academic year)

  Academic year: 2021/2022 Credits: 54h

  Attending students: 32 Course: M. Postel and B. Al Taki

  We approach in this course the various following notions: $\mathbb{R}$: Order and intervals, Limits, Continuity, Derivations, Usual and reciprocal functions, Mean Value theorem, Taylor expansion, First order linear differential equations, The field $\mathbb{C}$ and the complex exponential, Polynomials, Roots, Rational fractions, Euclidean division, $\mathbb{R}^2, \mathbb{R}^3$, Scalar and vector product.

- Course: Calculus II (first academic year academic)

  Academic year: 2021/2022 Credits: 112h

  Attending students: 30 Course: Vincent Minerbe and B. Al Taki

3.6. Lebanese University

- Course: model and numerical method in geosciences (Master 2-PDEs).

  Academic year: 2018/2019 Credits: 18

  Attending students: 15 Course: J. Sainte-Marie and B. Al Taki

The purpose of the part I taught is to present recent mathematical results on the viscous Shallow-Water equations.

$$\begin{cases} \partial_t h + \operatorname{div}(hu) = 0 \\ \partial_t (hu) + \operatorname{div}(hu \otimes u) - \operatorname{div}(2h\mathrm{D}(u)) + gh\nabla h = f \end{cases}$$

First, a few words on how to obtain these equations from the incompressible Navier-Stokes equations. Then, we discussed the elliptic problem associated with these equations. More precisely, I identified the difficulty introduced by the fact that the water height h can be degenerate at the boundary by studying the following system:

$$\begin{cases} \operatorname{div}(h\mathrm{D}(u)) & = f \\ u|_{\partial\Omega} & = 0, \end{cases}$$

with u is the unknown of the system, and f a given function in a L^p space. Indeed, the fact that h can degenerate prevents us to apply the well-known Lax-Milgram theorem's in a classical Sobolev space frame. The existence of a solution, in this case, could be shown in weighted Sobolev spaces. Therefore, for the complete system, I started by talking about different methods used in the proof of solution existence, notably Galerkin's method and Schauder's fixed point. Then I talked about the difficulties: degeneration of h, non-linear terms. In addition, I made the calculation of different types of energies associated with this system (energy estimation and BD-entropy). The stability of an approximate solution was studied afterward. I recalled the different notions of compactness which allows us to pass to the limits in nonlinear terms. Finally, I gave some points on the question of the construction of an approximate solution.

3.7. Université de Savoie Mont Blanc

- Course: Real Analysis (first academic year)

  Academic year: 2016/2017 Credits: 32h

  Attending students: 32 Course: C. Bourdarias and B. Al Taki

  In this course, we discuss the following concepts: Real and complex numbers, Logic and sets (logical operators, Quantifiers, Demonstration techniques), Real and complex sequences, Functions of a real variable, Finite expansions, Bijective functions, Logarithm and exponential, Trigonometric functions.

- Course: Functional analysis (first academic year)

  Academic year: 2016/2017 Credits: 32h

  Attending students: 32 Course: P. Barras and B. Al Taki

  In this course we discuss the following concepts: Intervals of $\mathbb{R}$, Upper and lower bounds, Numerical sequences (arithmetic and geometric), Theorems of convergence of sequences (monotonic, adjacent, recurring, and extracted sequences), Real functions (minor, major and bounded functions), Parity and periodicity of a function, Limits and continuity, Reciprocal functions, Derivatives of usual functions, Local Extremum, Mean value theorem.

- Course: Statistics (second academic year)

  Academic year: 2016/2017 Credits: 32h

  Attending students: 32 Course: L. Vuillon and B. Al Taki

  In this course we deal with the following notions: Introduction, Addition and multiplication law of probability, Conditional probability, Random variables (Discrete and Continuous Random variable), Probability mass function and Probability density function, Expectation and variance, Discrete and Continuous Probability distribution: Binomial, Poisson and Normal distributions.

- Course: Probability and statistics (third academic year)

  Academic year: 2016/2017 Credits: 24h

  Attending students: 36 Course: S. Gerbi and B. Al Taki

  In this course we discuss the following concepts: Introduction, Discrete probabilities on subsets of $\mathbb{R}$ (Bernouilli, geometric, etc), Density probabilities on subsets of $\mathbb{R}$ (uniform, beta, exponential, etc), Random variable, Independent variables, Normal Distribution, Chi-2 Distribution, Student Distribution, Fisher-Snedecor Distribution, Hypothesis, Null hypothesis, Alternative hypothesis, Testing a Hypothesis, Level of significance, Confidence limits, Test of significance of difference of means, Empirical mean, Central Limit Theorem, Confidence intervals, Hypothesis tests on means, Homogeneity test: independent samples, Homogeneity test: paired samples.

- Course: Linear Algebra (first academic year)

  Academic year: 2016/2017 Credits: 28h

  Attending students: 34 Course: M. Raibaut and B. Al Taki

  In this course, we discuss the following concepts: Reminders on set operations, relations on a set, N, Z, Q, Euclidean division, polynomials and rational fractions, vector spaces, sub-vector spaces, operations, cases of $\mathbb{R}^2$ and $\mathbb{R}^3$, free families, generators, bases, coordinates, dimension, and so on.

4 Teaching Perspectives

One of my main goals as an educator is to integrate e-learning techniques alongside traditional classroom instruction. Even before the pandemic, I believed that digital tools could significantly enhance the learning experience. While online resources will never replace the role of a dedicated teacher, they can complement in-person teaching by providing flexibility, interactive content, and opportunities for self-paced learning.

4.1. Courses that I would be happy to teach in the future

My academic background is rooted in mathematical analysis, but over the years I have expanded my teaching portfolio to include algebra, statistics, Data Marketing, Financial Econometrics and probability. Recently, I have developed a strong interest in data science and artificial intelligence, and I am motivated to prepare and teach courses in these areas. Some examples include:

- Database Management System
- Python for Machine Learning and Data Science
- Mathematics for machine learning: Linear Algebra and multivariate calculus
- Mathematics for machine learning: Principal Component Analysis

This list is not exhaustive. My experience in applied mathematics and computational modeling gives me the flexibility to design and teach additional courses that bridge theory and application.

4.2. Towards improving my teaching methodology in the future

I'm aware of the need for documenting my teaching activities. In the coming years, I intend to

- develop a database with significant samples of the students' work,
- develop a database with assessments of my classes that specifically addresses my different teaching goals, and
- learn how to better organize group work activities in-class and outside class.