Mathematics Lesson Plan

Dr. Walid Remili

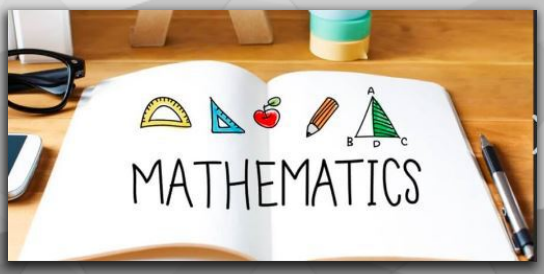
Mohamed Boudiaf University of M'sila

Institute of Urban Techniques Management

Department of Architecture

Email: walid.remili@univ-msila.dz

0.1 Mai 2024



Dr. Walid Remili

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I Contact Card

- University: University of Mohamed Boudiaf M'sila, Ichebilia, M'sila, Algeria.
- Faculty: Science Institute of Urban Techniques Management.
- Department: Architecture.
- Target Group: First year of Bachelor Students.
- Specialty: Architecture
- Subject: Mathematics
- Coefficient: 2
- Credit: 5
- Lecture and Tutorial class
- Volume Honiara: 3 hours per week/ 45 hours per semester.
- Thursday: From 9:30 am to 12:30 pm
- Teacher's name: Dr. Walid Remili
- Email: walid.remili@univ-msila.dz[1].

Response on the forum: Any question related to the course should be posted on the dedicated forum. I ensure that everyone can benefit from my response and I will answer the questions within a 48-hours.

Via email: I commit that I will responding questions via email within 48 hours of receiving the message except in unfortunate circumstances. I would like to emphasize that the preferred communication is the forum, and email should be reserved for 'urgent' matters (such as platform access issues).

1. mailto:walid.remili@univ-msila.dz

II Presentation of the Lesson

The evolution of mathematics education has redefined its role, particularly in the realm of geometry, within the training curriculum for architecture students. This program aims to equip students with essential tools that enable them to conceptualize, represent, and compute the shapes and spaces they envision.

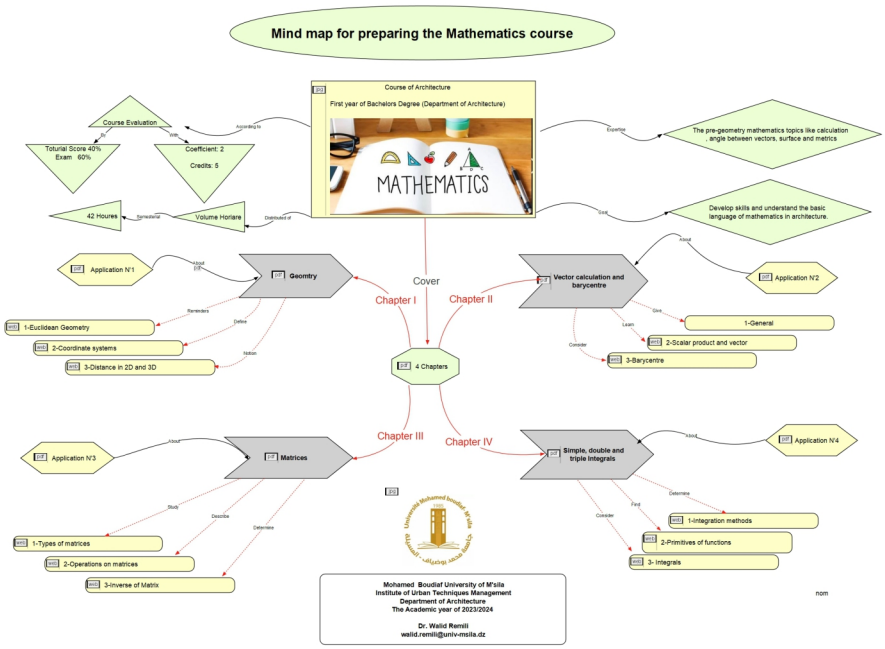
In the first semester of the bachelor's program in architecture, students are taught various subjects, including matrices and simple, double, and triple integrals. The primary goal of this course is to guide students in enhancing their mathematical skills and to prepare them to apply these concepts to solve problems in architecture. Mastering mathematics not only lays the groundwork for success in architecture courses but also provides a solid foundation for future academic and professional pursuits.

This course provides students with a foundational understanding of essential mathematical concepts and skills needed in the field of architecture. These concepts include solving equations using matrix methods and calculating areas and volumes through integration techniques in one, two, and three dimensions. By mastering these mathematical tools, students will be better equipped to tackle complex architectural problems, enhancing their ability to design and analyze structures with precision and confidence. This strong mathematical foundation is crucial for their success in advanced architecture courses and professional practice.

Furthermore, this course emphasizes the practical application of mathematics in real-world architectural scenarios. Students learn how to translate theoretical mathematical principles into tangible design solutions, fostering a deeper appreciation of the interplay between mathematics and architecture. This integrated approach ensures that graduates are not only proficient in mathematical techniques but also adept at applying these skills creatively and effectively in their architectural endeavors.

III Content of the Lesson

This course covers various interconnected topics, organized in chronological order to facilitate understanding. Each topic is explained through a series of exercises designed to reinforce and simplify comprehension. In Chapter 1, we introduce the fundamental tools and primary theorems essential to the study of Euclidean Geometry. Chapter 2 covers vector calculations and the concept of a barycenter. Chapter 3 explores different types of matrices, operations on matrices, and the inversion of matrices. Finally, simple, double, and triple integrals are presented in the last chapter. A summary of the lessons is provided at the end of the course. The content is detailed in the accompanying mind map (see Figure 1).



The mind map illustrates the detailed content of each chapter of this mathematics course. For more information, additional details are available online or on the platform (please click here "Details plan")

IV Prerequisites

To fully comprehend this course, students should have the following prerequisites:

- Students should have an understanding of vector operations, including addition, subtraction, and multiplication.
- The student must be proficient/skills in solving simple linear equations.
- Students should have an understanding of multivariable functions.
- The student must be proficient/skilled in deriving functions.
- To assess these three prerequisites, a test is available on the distance learning platform:http://elearning.univ-msila.dz

The aim of this test is to evaluate your knowledge of mathematics prerequisites. The test is available from the first week, lasts 5 minutes, and you have only one attempt. If your score is below 60%, it is recommended that you read the following books. (click here to download *chapter 12.3.4....pdf (cf. chapter 1,2,3.4,..)*, . i.e., These books are recommended for those who did failed the quizzes of tribal gains.

The following instructions:

- In the navigation block, click on 'my courses.
- Click on the course then 'Tribal gains Test' to access it.

V Learning Objectives

The purpose of this course is to provide students with a comprehensive understanding of fundamental concepts and practical applications within the field. Therefore, the aims of this lesson are to:

- Recall the basic definitions and properties of matrices.
- Solve systems of linear equations using matrix operations.
- Develop skills and understanding of the calculation of integrals in different dimensions.
- Judge the efficiency of different integration techniques in terms of computational complexity and accuracy.

VI The Evaluation (The assessment methods of learning)

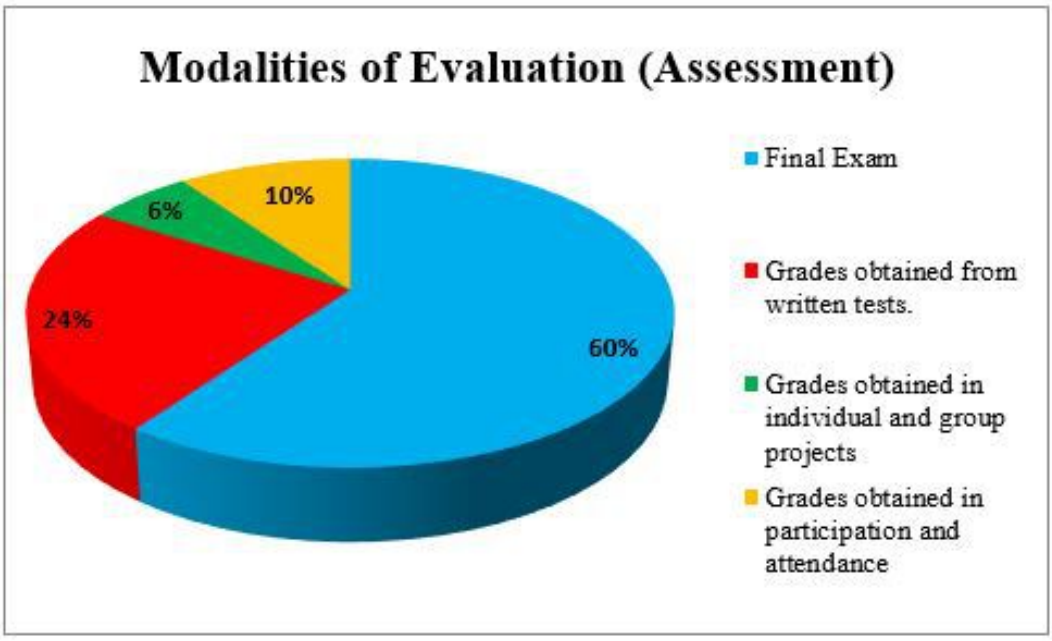
Final Exam

- **Date and location:** To be determined.
- **Work mode:** Individual.
- **Weighting:** 60%.
- **Evaluation guidelines:** The supervised exam is comprehensive, consisting of both practical and theoretical components. It is an individual assessment, and no reference materials (lecture notes, lab instructions or solutions, books, articles, handouts, etc.) are allowed, except for a double-sided A4 sheet. Electronic devices (smartphones, laptops, PDAs, etc.) are strictly prohibited during the exam. Any copies, notes, or additional documents provided during the exam must be submitted by the students at the end of the session.

VII Continuous and regular assessment (Tutorial Series TD)

With the remaining 40%, allowing you to accumulate points throughout the semester, this continuous assessment is conducted through various forms:

- Grades obtained from written tests.
- Grades obtained in individual and group projects.
- Grades obtained in participation and attendance



The final grade required to pass this course must be greater than or equal to 10

VIII Teaching-learning activities

This course is offered through two methods:

- In-person (face to face).
- Partially remote (theory remotely, practices in-person).

1. **In-Person (Face to Face):**
    - The course is delivered through lectures.
    - During the course, everyone is invited to participate in debates, which are generally initiated by questions. This aims to foster exchanges of ideas among students.
    - Individual and group projects are also proposed to complement and deepen the knowledge acquired during the lectures.
2. **Partially remote:**
    - The course is offered partially remotely, with theoretical sessions conducted online and practical sessions held in person. These are accessible through the Moodle platform of the Elearning University of M'sila.
    - For course-related questions, students can either post their messages on the platform forums (Moodle: Elearning University of M'sila) or directly contact the course instructor via email at walid.remili@univ-msila.dz.
    - To ensure proper organization of the course material, students are encouraged to take quizzes offered in various formats, such as multiple-choice questions (MCQs) and multiple-select questions (MSQs).

IX A pedagogical approach (Pedagogical Alignment)

The theoretical aspect of the course:

The theoretical aspect of mathematics in architecture is a vast and multifaceted field that involves the application of mathematical principles and concepts to design, analyze, and construct buildings and other structures. This interdisciplinary area spans various branches of mathematics and integrates them into the practice of architecture. Here are some key theoretical aspects:

- **Geometry :**

  Geometry is fundamental to architectural design. Classical geometry provides the tools for creating shapes, angles, and forms that are aesthetically pleasing and structurally sound. Classical architecture uses Euclidean geometry to create designs.

- **Algebra**

  Algebra, including linear algebra, is used in solving structural problems and in computer-aided design (CAD) software.

- **Calculus**

  Calculus is crucial for modeling and analyzing dynamic systems and for solving problems related to change and motion within architectural structures.

The practical aspect

The practical application of mathematics in architecture involves utilizing theoretical concepts to solve architectural problems and analyze various situations. Here are some examples of how mathematics is applied in architecture:

- **Euclidean Geometry**: Used in the design of basic shapes and forms, such as squares, rectangles, and circles.
- **Matrices and Vectors**: Essential in structural analysis and for transformations in computer graphics.
- **Integral Calculus**: Applied in areas such as material quantities and structural load analysis

X Operating procedures (Operating modalities)

These operating procedures are designed to cultivate an interactive and engaging learning environment in both lecture and tutorial series, fostering active participation, comprehension, and mastery of mathematical concepts. They aim to promote not just passive absorption of information but rather active engagement with the material, facilitating a deeper understanding and proficiency in mathematics.

1. **Introduction:** Commence each lecture with a comprehensive overview of the topics slated for discussion.
2. **Presentation of Concepts:** Articulate mathematical concepts in architecture and theories with clarity and structure, utilizing illustrative examples and visual aids to enhance comprehension.
3. **Interactive Discussions:** Foster student engagement through interactive sessions encompassing inquiries, discussions, and collaborative problem-solving activities, thereby solidifying understanding.
4. **Demonstrations:** Employ demonstrations or worked examples to elucidate intricate concepts and problem-solving methodologies, facilitating enhanced comprehension.
5. **Application Exercises:** Facilitate opportunities for students to employ acquired knowledge through in-class exercises and problem sets, promoting practical application and skill development.
6. **Review and Recap:** Conclude sessions with a succinct recapitulation of key points covered during the lecture, addressing any lingering misconceptions to ensure comprehensive understanding before concluding the session.

Tutorial Series (TD)

1. **Problem-Solving Sessions:** Conduct tutorial sessions dedicated to tackling mathematics problems in architecture, encompassing both theoretical and practical applications.
2. **Group Activities:** Coordinate group activities and collaborative problem-solving exercises to cultivate peer learning and active engagement among students.
3. **Individualized Assistance:** Offer personalized guidance and support to students seeking clarification or additional assistance on specific topics, ensuring every student's needs are addressed.
4. **Practice Problems:** Assign supplementary practice problems and assignments outside of class to reinforce comprehension and application of concepts.
5. **Feedback and Assessment:** Provide timely feedback on students' performance in tutorial activities and assessments, enabling them to track their progress and identify areas for enhancement.
6. **Review Sessions:** Conduct comprehensive review sessions prior to exams or assessments, consolidating learning, addressing lingering inquiries, and preparing students effectively for evaluations.

XI Support resources (Help resources)

Here are some useful and recommended resources for students in the field of Mathematics.

Books

1. J. J. Sylvester. A demonstration of the theorem that every homogeneous quadratic polynomialis reducible by real orthogonal substitutions to the form of a sum of positive and negativesquares. Philosophical Magazine, IV, 23:47–51, 1852.
2. Thomas Muir. The Theory of Determinants in the Historical Order of Development. Dover,New York, 1960.
3. J. T. Schwartz, Introduction to Matrices and Vectors, Dover Books on Mathematics. Dover Publications, 2012
4. Prudnikov, A., Y. A. Brychkov, and O. Marichev, 1986, Integral and Series, Vol. 1 (Gordon and Breach, New York).

Paper

- Intégrales triples, François DE MARÇAY Institut de Mathématique d'Orsay

Université Paris-Saclay, France

Wikipedia

- Multiple integral - Wikipedia https://www.bing.com/ck/a?!&&p=842353a6da7bbf2bJmltdHM9MTcwOTMzNzYwMCZpZ3VpZD0yYzE yMDIxYy05MDE1LTY5M2UtMzViYS0xMzQwOTFjODY4OGImaW5zaWQ9NTMwMQ&ptn=3&ver=2&hsh=3& fclid=2c12021c-9015-693e-35ba-134091c8688b&psq=double+integral&u=a1aHR0cHM6Ly9lbi53aWtpcGVk aWEub3JnL3dpa2kvTXVsdGlwbGVfaW50ZWdyYWw&ntb=1[2]

Web

1. https://www.mathsisfun.com/algebra/matrix-inverse.html
2. https://www.youtube.com/watch?v=p48uw2vFWQs

2. Wikipedia - https://www.bing.com/ck/a?!&&p=842353a6da7bbf2bJmltdHM9MTcwOTMzNzYwMCZpZ3VpZD0yYzE yMDIxYy05MDE1LTY5M2UtMzViYS0xMzQwOTFjODY4OGImaW5zaWQ9NTMwMQ&ptn=3&ver=2&hsh=3& fclid=2c12021c-9015-693e-35ba-134091c8688b&psq=double+integral&u=a1aHR0cHM6Ly9lbi53aWtpcGVk aWEub3JnL3dpa2kvTXVsdGlwbGVfaW50ZWdyYWw&ntb=1