

Plano de Ensino

01. Dados de Identificação da Disciplina:

Semestre:	2023.2	Curso:	Matemática
Turma:	A	Código Componente:	IME0495
Componente:	MATHEMATICAL INVESTIGATIONS WITH FREE SOFTWARE TOOLS: CALCULATIONS, VISUALIZATIONS AND ANIMATIONS.	UA Responsável:	IME
Carga Horária:	64	UA Solicitante:	IME
Teórica/Prática:	64/-	EAD/PCC:	-/-
Horários:	24t56	Docente:	Prof(a) Ole Peter Smith

02. Ementa:

Drawing and visualizing functions depending on parameters using Geogebra. Introduction to derivatives, visualization. Geometrical constructions with Geogebra and TikZ/LaTeX. Introductions to graphical formats, bitmaps versus vectorial graphics. SVG, TikZ. Parameterized planar curves; derivatives and curvature. Other tools for calculus and visualization: Python, Javascript.

03. Programa:

1. Drawing and visualizing functions depending on parameters using Geogebra.
2. Introduction to derivatives, visualization.
3. Geometrical constructions with Geogebra and TikZ/LaTeX.
4. Introductions to graphical formats, bitmaps versus vectorial graphics. SVG, TikZ.
5. Parameterized planar curves; derivatives and curvature.
6. Other tools for calculus and visualization: Python, Javascript.

04. Cronograma:

1. Functions and derivatives. 16hs.
 - (a) Visualization and animation of functions with parameters (Geogebra).
 - (b) Introduction and visualizations of derivatives (Geogebra).
 - (c) Approximating functions with derivatives and Taylors Formula (Python).
2. Planar Analytical Geometry. 16hs.
 - (a) Triangles (Geogebra, TikZ).
 - (b) Convex and biconvex parametrizations (Geogebra and TikZ).
 - (c) Geometrical constructions (Geogebra, TikZ).
 - (d) Parametrization of circles, parabolas, ellipses and hyperbolas (Geogebra, TikZ).
3. Parametrized Planar Curves. 16hs.
 - (a) Curve investigations. Determinant, curvature and evolutes (Geogebra, SVG/Javascript).
 - (b) Parabolas, ellipses and hyperbolas revisited (Geogebra, SVG/Javascript).
 - (c) Cycloids and Trochoids (Geogebra, SVG/Javascript).
4. Assessment activities. 16hs.

05. Objetivos Gerais:

1. Familiarize the students with classes in english.
2. Introducing the students to mathematical modelling, investigation and concepts.
3. Introducing the students to visualization of mathematical models.
4. Introducing the students to free mathematical software tools.
5. Familiarize with the ideas of free software and available tools.

06. Objetivos Específicos:

1. Introducing the students to parameterized functions, derivatives and Taylors formula.
2. Introducing the students to Geometrical constructions.
3. Familiarize the students with parametrization of geometrical objects.
4. Introduce the students to parameterized planar curves and curvature.
5. Familiarize the students to the use of the english language in class room situations.

6. Introduce the students to free software tools, such as Geogebra, Python, $\text{\LaTeX}$ /TikZ, SVG and Javascript.

07. Metodologia:

The 4 weekly one-hour classes (in english) will be executed as:

- 2 hours of proposed activities in computer lab (generally on wednesdays).
- 2 hours online (synchronous) via Google Meet (<https://meet.google.com/hjg-aaup-ype>), the teacher exposing his screen, exhibiting the working methods.

Throughout the course, students are encouraged to produce their own graphics and animations, using available software tools.

08. Avaliações:

During the course, 2 tests will be applied. In each of them, the student will receive a proposed exam by email, containing selected draw able situations. The students will then have at the least on week, to elaborate response, to be delivered electronically.

Proposed schedule (may be altered negotiating with the students):

- Exam 1: 13-20/12/2023. - Exam 2: 29/01-05/02/2024.

The final mark will be the geometrical mean of the marks of the two exams.

09. Bibliografia:

[1]: REIS, G. L. e SILVA, V. V.; Geometria Analítica, Rio de Janeiro LTC Editora, 2 a Edição, 1997.

[2]: LEITHOLD, L. O Cálculo com Geometria Analítica. 3 ed. V. 1. São Paulo: Harbra, 1994.

[3]: APOSTOL, T. Linear Algebra A First Course with Applications to Differential Equations, Wiley- Interscience, 1997.

[4]: RUGGIERO, M. A. G.; LOPES, V. L. R.; Cálculo numérico Aspectos teóricos e computacionais; 2 a ed.; Makron Books, São Paulo, 1996.

[5]: NETTO, S. L. Construções Geométricas: Exercícios e Soluções. Sociedade Brasileira de Matemática, 1a ed. Rio de Janeiro, 2006.

10. Bibliografia Complementar:

[1]: ÁVILA, G. S. S. Cálculo: Funções de uma Variável. 7 ed. V. 1. Rio de Janeiro: LTC, 1994.

[2]: KOLMAN, B.; HILL, D.. Introdução a Álgebra Linear e Aplicações, LTC, 2006.

[3]: BURDEN, R. L.; FAIRES, J. D. Análise Numérica; Cengage Learning, São Paulo, 2003.

11. Livros Texto:

[1]: REIS, G. L. e SILVA, V. V.; Geometria Analítica, Rio de Janeiro LTC Editora, 2 a Edição, 1997.

[2]: NETTO, S. L. Construções Geométricas: Exercícios e Soluções. Sociedade Brasileira de Matemática, 1a ed. Rio de Janeiro, 2006.

[3]: RUGGIERO, M. A. G.; LOPES, V. L. R.; Cálculo numérico Aspectos teóricos e computacionais; 2 a ed.; Makron Books, São Paulo, 1996.

12. Horários:

Dia	Horário	Sala Distribuida
2 ^a	A5	105, CAC (20)
2 ^a	A6	105, CAC (20)
4 ^a	A5	105, CAC (20)
4 ^a	A6	105, CAC (20)

13. Horário de Atendimento do(a)s Professor(a):

1. 2a 15-16, via google meet: <https://meet.google.com/hjg-aaup-ype>.

2. 4a 19-20, via google meet: <https://meet.google.com/hjg-aaup-ype>.

14. Professor(a):

Ole Peter Smith. Email: ole@ufg.br, IME

Prof(a) Ole Peter Smith