Differential Geometry

Lecture Notes

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20 Sep 2023

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Welcome

These are the Lecture Notes of **Differential Geometry 661955** for T1 2023/24 at the University of Hull. We will study curves and surfaces in $\mathbb{R}^3$. I will follow these lecture notes during the course. If you have any question or find any typo, please email me at

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Up to date information about the course, Tutorials and Homework will be published on the University of Hull **Canvas Website**

canvas.hull.ac.uk/courses/67594

and on the **Course Webpage** hosted on my website

silviofanzon.com/blog/2023/Differential-Geometry

Readings

The main textbook of the course is Pressley [5]. Other interesting readings are the books by do Carmo [2] and Bär [1]. I will assume some knowledge from Analysis and Linear Algebra. A good place to revise these topics are the books by Zorich [6, 7].

Visualization

It is important to visualize the geometrical objects and concepts we are going to talk about in this course. I will show basic Python code to plot curves and surfaces. This part of the course is **`not required`** for the final examination. If you want to have fun plotting with Pyhton, I recommend installation through Anaconda or Miniconda. The actual coding can then be done through Jupyter Notebook. Good references for scientific Python programming are [3, 4].
If you do not want to mess around with Python, you can still visualize pretty much everything we will do in this course using the excellent online 3D grapher tool CalcPlot3D. To understand how it works, please refer to the help manual or to the short video introduction.

! You are not expected to purchase any of the above books. These lecture notes will cover 100% of the topics you are expected to known in order to excel in the final exam.

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> Fanzon, Silvio. (2023). *Lecture Notes on Differential Geometry*. https://www.silviofanzon.com/2023-Differential-Geometry-Notes/

BibTex citation:

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@electronic{Danzon-Diff-Geom-2023,
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References

[1] C. Bär. *Elementary Differential Geometry*. Cambridge University Press, 2010.

[2] M. P. do Carmo. *Differential Geometry of Curves and Surfaces*. Second Edition. Dover Books on Mathematics, 2017.

[3] R. Johansson. *Numerical Python. Scientific Computing and Data Science Applications with Numpy, SciPy and Matplotlib*. Second Edition. Apress, 2019.

[4] Q. Kong, T. Siauw, and A. Bayen. *Python Programming and Numerical Methods*. Academic Press, 2020.

[5] A. Pressley. *Elementary Differential Geometry*. Second Edition. Springer, 2010.

[6] V. A. Zorich. *Mathematical Analysis I*. Second Edition. Springer, 2015.

[7] V. A. Zorich. *Mathematical Analysis II*. Second Edition. Springer, 2016.