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DIPARTIMENTO DI ELETTRONICA
INFORMAZIONE E BIOINGEGNERIA

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2023

Dipartimento di Elettronica, Informazione e Bioingegneria

Computer Graphics

Milano, 2023

Computer Graphics

- Introduction to the course

Course structure

The course will be composed by 2 hours of in-person sessions, on Monday and Wednesday.
Each session will mix theory, examples and applications.

It will be given by
Prof. *Marco Gribaudo*

Slides will be published on the WeBeep web page.

Lessons will be recorded and Video will be made available after as small delay, as requested by the Faculty.
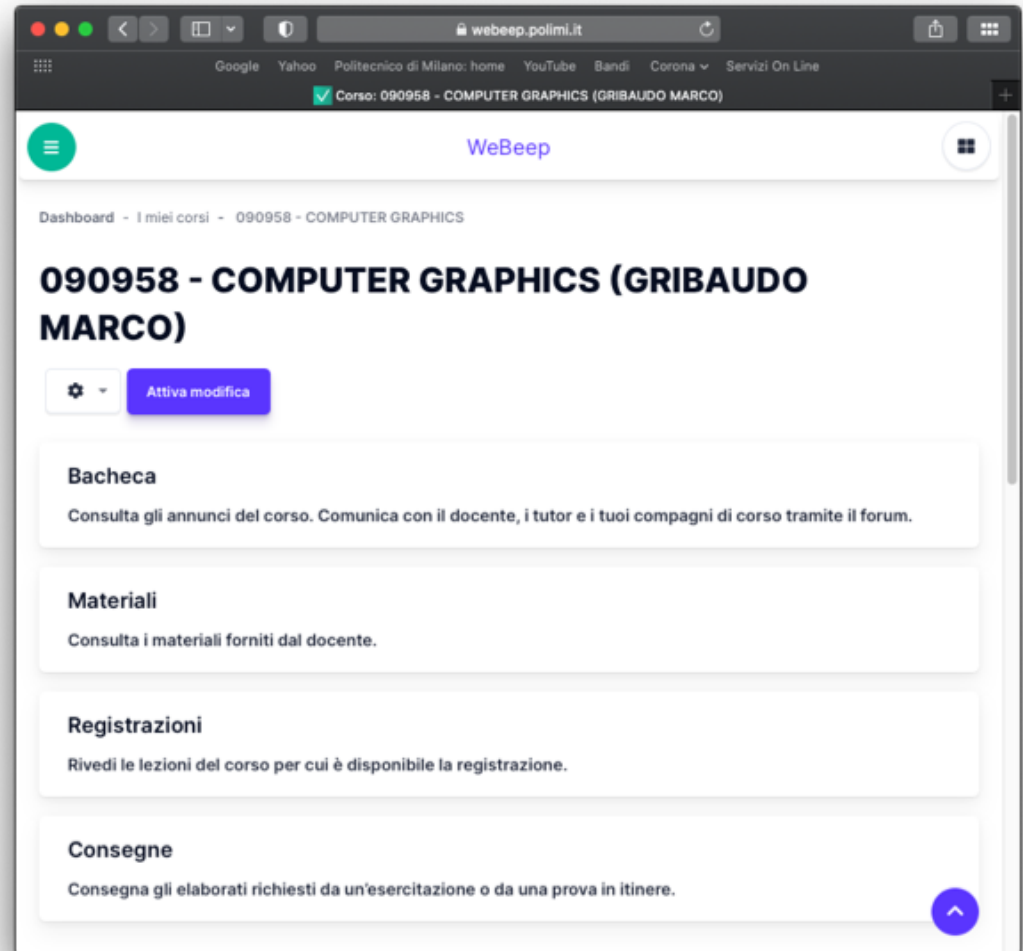
Course structure

Theory will describe the techniques, the algorithms and the main data-structures involved in Computer Graphics.

Assignments and examples will show practical implementation of the proposed techniques.

The main structure of the course will be the following:

- Basic 3D graphics
- *Vulkan*
- Shaders and real-time rendering

Why Vulkan?

OpenGL, even if still supported, has become obsolete in many aspects.

Currently, **Vulkan** is the most supported standard that allows to perform low-level graphics operations.

It is available on:

- Android, Linux, BSD Unix, QNX, Nintendo Switch, Raspberry Pi, Stadia, Fuchsia, Tizen, Windows (from version 7)
- MoltenVK provides freely-licensed third-party support for iOS and macOS based on Metal.

C++

We will be using C++ to interface with Vulkan.

Do not worry! Although Vulkan is very complex, and C++ is not a simple programming language, we will limit our usage to the main features of both, which are relevant to the theoretical part of this course:

- We will make sure that using both technologies will not be much more complex than *WebGL* with *Javascript* in *HTML5* pages.

- More technical students will be able to enjoy the powerful and advanced features of both technologies.

- Less technical students will have pre-built starting points, where only "standard programming language code" should be added to obtain the desired graphics results.

- However, students are **required** to be *comfortable* with programming, regardless of their curriculum.

Hardware requirements

Although most of the platforms are supported, Vulkan requires a development environment with a suitable GPU.

Almost any PC or Mac built after 2014 should be able to run it.

Conversely, almost no PC or Mac built before 2011 might be able to run it.

The *Vulkan Starter Day*

Setting up the development environment for your own specific system will probably be the most difficult initial step.

Assignment zero has the purpose of letting you install and understand your own Vulkan development environment.

We will do very soon a *Vulkan Starter Day*, to help to install and compile Vulkan applications on your laptop.

- *Volunteers are needed!* If you succeed installing and running *Assignment zero*, please come on the *Vulkan Starter Day* to help your classmates in setting up their environment and complete the task as well.

Expected outcome and Application Fields

Knowledge of the theoretical basics of Computer Graphics.

Introductory knowledge of Vulkan.

There are many application fields, some may be:

- Video Games Design
- Scientific Visualization
- Architectural Visualization

Exam

During the course several assignments + a complete project will be given.

The exam will be an oral discussion where the project and the assignments will be presented. Some theory questions might be asked to verify the level of knowledge of the topic.

Projects topics and rules will be presented after the middle of the course, when we will have seen sufficient material to start implementing it.

Marco Gribaudo
Associate Professor

CONTACTS

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(Remember to use the phone, since mails might require a lot of time to be answered. Microsoft Teams messages might also be faster than regular mails)