Montana State University
School of Architecture

Computer Specifications
Spring Semester of Second Year

September 19, 2023

As part of the second year curriculum in the School of Architecture, all second year students are required to have a notebook (laptop) computer for the Spring Semester. Many students purchase a computer for the fall semester, but ARCH 262 Architectural Graphics II in spring semester of second year is the first course where a notebook computer is required.

This document will provide information on the computer and software requirements to help you choose which computer to purchase. At this time the school allows both PC and Mac computers, however, a large part of the design industry is PC-based and some software programs—Revit, Enscape, Lumion, Some Grasshopper plugins—have not been available for the Mac Operating System (OS).

- As such, if you purchase a Mac to meet the specifications below, it is very important that you also install the Windows operating system on your Mac—through Parallels.
- In addition, it is equally important that you purchase **a PC or a Mac with a discrete graphics card.** An integrated graphics card is not sufficient to run the programs we utilize.
    - This will be explained below, but there are some rendering programs—Enscape and Lumion—that will only work using a discrete graphics card. More about this later.

Often, students ask if they you need a new computer for *Arch 262 Architectural Graphics II*. It usually depends on the RAM, processor and graphics card in your computer. Depending upon those items, a 1-3 year old machine may take you through second and even third year. At some point, however, you will likely want to upgrade. If your computer is 4-6 years or older, it likely will not work as effectively and you should consider buying a new one—the information that follows may help with that purchase. We will work our way through the hardware requirements for a new computer but it is the software requirements that typically determine if a computer is adequate. In addition, the software we cover in *ARCH 363, Architectural Graphics III*—in the fall semester of your third year—is more advanced and typically requires more memory and a faster computer. As such it has not been uncommon for students to upgrade to a newer computer over the summer to address the more robust needs of the software in ARCH 363.

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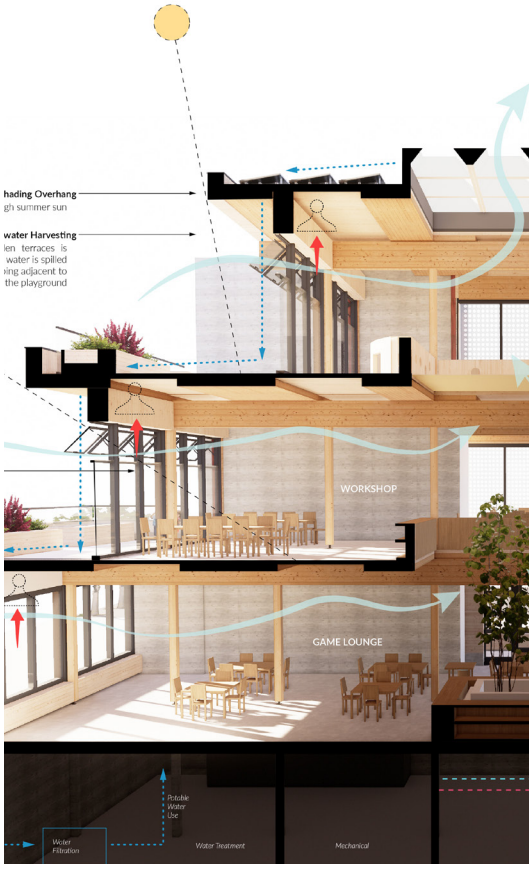
Second Year Software

A Perspective to keep in mind: The budget that you have to purchase a computer should also factor into the hardware and software decisions you make. Purchasing a computer is a process that is repeated every 3-5 years. So plan accordingly. There is always a better machine that comes out shortly after any of us buy a computer—so select a machine that is good and will satisfy both your performance needs and your budget. The goal is not to put yourself in a bad financial position by buying your computer. But you also want to have a computer that will allow you to do the things you want and need to do while in school.



ARCH 262

Required Software

In ARCH 262, spring semester 2nd year, we focus on the following software:

3D Rhinoceros version 7. The School has instituted a policy of providing networked licenses of Rhino 7 to students. This will allow students to use this free license while connected to the MSU secure network.

Students would also have the option to purchase this software for their own personal use. Rhino7 is available at the MSU Bookstore for $95, which is the lowest price we have found anywhere. Rhino's website sells student licenses for $195, so if you choose to purchase Rhino we recommend purchasing it from the bookstore. You will likely be using this software for the next 4 years of school—and likely longer! Following is a link to Rhino's website, www.rhino3d.com

- Rhino version 7 includes Grasshopper--this is true for both the PC and Mac operating systems.
- You can install Rhino 7 on either operating system for Arch 262.

RhinoCAM. This is the program you will use for the Computer Numerically Controlled Milling Machine (CNC).

- The School of Architecture provides this software on the workstations in the School of Architecture's computer lab. This software runs only on PCs. You do not need to purchase or install this software.

Adobe Photoshop, Illustrator, InDesign and Acrobat. We will use all of these software programs, but you can download them for free as MSU students through the Adobe Creative Cloud program at http://www.montana.edu/uit/students/adobe/

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Operating Systems

SketchUp Pro 2021/2022. This software is made available to you through the school of Architecture.

- The School provides a network license that allows you to use SketchUp Studio on your computer. In October, we will upgrade the license to SketchUp Studio 2023.

Cove.Tool This energy and daylighting analysis software is also provided to students by the school.

Hardware Recommendations

While the above programs are graphic intensive software programs, the ARCH 262 software is less intensive than the programs we will use in ARCH 363 during the Fall Semester. In many respects, the RAM, graphics card and processor requirements for the software we use in Arch 363—Revit and Lumion in particular—tend to be the software that determines the needs of your computer.

There are some basic categories to check when you buy a new computer or to determine if your existing computer is still viable.

Operating System

Students have used both PCs or Macs in the past. The architectural industry is still dominated on the PC side (i.e. Autodesk Revit and some rendering programs only work on the PC side), which means that even if you have a Mac you need to have the Windows operating system on it—usually through Parallels—to run a number of the programs in ARCH 363.

- In addition, the digital fabrication software, RhinoCAM, and the rendering software Lumion and Enscape only run on the Windows operating system.
- If purchasing a Mac it is important that you also purchase and install the Windows operating system in order to operate a number of the software programs we use.

RAM & VRAM Memory

RAM Memory (Random Access Memory)

The minimum RAM for most of the programs is 8 GB, but we recommend 16 to 32 GB of RAM.

- In ARCH 363, Revit and Lumion recommend a similar range of RAM 16 GB up to 32 GB. RAM is relatively inexpensive and it helps tremendously in working with these graphic-intensive programs and large digital models. While you can often add RAM later on, this is one area that will make a difference in the speed and effectiveness of your computer and you might consider increasing the RAM up when you buy a computer.

VRAM (Graphics Card)

It is very important—whether you purchase a PC or a Mac—that your computer have a discrete graphics card (sometimes called a dedicated graphics card). Computers will have an integrated graphics card (often an Intel HD graphics card) but this does not provide the graphics speed that our programs require. Your computer needs a discrete graphics card—Nvidia or AMD are good examples of discrete graphics cards.

This is a very important component of your computer. It will determine how quickly graphics can be displayed on your computer and is very important when we get to rendering programs in ARCH 363. For ARCH 262, the software would require a 4 GB graphics card at the low end.

However, if you look at the attached chart you will see that some of the programs such as Lumion recommend 10 GB or higher. **We recommend discrete graphics cards that are between 4 GB and 10 GB depending upon your budget.**

Unlike your RAM, you typically cannot upgrade your graphics card—although some external graphics cards are being introduced. However,your graphics card is an area that you may want to bump up a bit if your budget would allow it.

- You can check to see if your graphics card will run Lumion at the website, https://www.videocardbenchmark.net/high_end_gpus.html with a goal of Graphics card scoring a G3D Mark of 14,000 or higher (8000 is the minimum they recommend, but getting closer to the higher benchmark is preferable if your budget allows it).
- Some examples of graphics cards that meet this higher mark include graphics cards such as the Nvidia GeForce GTX 1060, Quadro K6000, AMD Radeon RX 580, or better.

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Hardware

CPU (Central Processing Unit)

The CPU performs all of the processing in your computer and like the graphics card it cannot be upgraded after you purchase it. It also makes a big difference in the speed at which your computer will operate. Typically i5-, i7- and i9- Intel processors will handle what we will do in ARCH 262.

- But again, the software in ARCH 363 is more demanding so if you are buying a new computer you will want to check out the processor requirements for Lumion on https://www.cpubenchmark.net/singleThread.html, You want to look for a processor that has a single thread speed CPUMark of 2000 minimum or 2200 recommended. Examples of processor types that will work with Lumion include the AMD Ryzen 5 2600, Intel Core i7-4790 or better.

Hard Drive

Hard drives have become relatively inexpensive and keep increasing in storage capacity over the years. In addition, you can supplement the hard drive by buying external hard drives if you should run out of space. There are two main types of hard drive—

- HDD hard drives have large storage capacity and are less expensive, but they also are slower and have moving parts that could be subject to breaking down.
- The other type is SSD (solid state drive) which operates like a flash drive with no moving parts. However, SSD are more expensive and do not have as large of capacity. However, SSD are faster than HHD in their operation. So this extra speed can greatly benefit the operation of your computer.

Given the size of the files we generate and how much disk space all of our software takes, an SSD drive of 512 GB is probably the minimum size you will want to have. It can act as your main drive (boot drive). You can supplement the SSD drive with an external hard drive, which are also relatively inexpensive. Or you could look at the costs to increase your SSD hard drive to 1 TB (Terabyte). Again, you can supplement your hard drive on your computer with an external drive if you need more space.

If you should choose the HDD drive, which is becoming less common and available, you will have more storage capacity and would probably want to consider 1 TB as the starting point for the storage size. Given the speed benefit of SSDs, however, we certainly recommend taking a look at the SSD option.

Monitors & Third Year Software

Monitor

While the monitor size of your laptop is fixed, students often purchase an external monitor to provide a larger work surface or a second screen. With this strategy, you reduce some costs by purchasing a 13-inch or 15-inch on your laptop and then purchase a larger external monitor for use at home or at school. Some students prefer a 17-inch laptop monitor but the size is up to you and your budget. 17-inch laptops will increase the price but again some students like the larger screen size.

Those are the main areas to look at when buying a computer. Just as a heads up, we want to outline the software we will use in ARCH 363 in Fall Semester 2023 and 2024. If you are buying a new computer this summer or next semester or summer, it would be wise to look at what we will use next Fall to make certain your new computer will be able to accommodate the programs we use in the third year of the program.

ARCH 363

Required Software

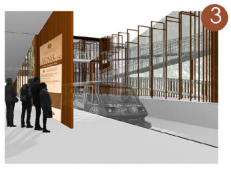
In ARCH 363, fall semester of 3rd year, we will focus on this software:

Grasshopper 1.0. This is a plugin that comes with Rhino 7. If your computer runs Rhino 7 without any problems, Grasshopper should perform in a similar manner on your computer. Some of this does depend upon the complexity of your 3D model, but meeting the requirements of Revit and Lumion should make your computer capable of running Grasshopper.

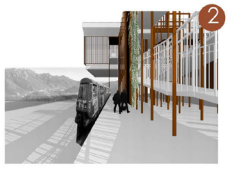
Autodesk Revit 2024. This is a Building Information Model (BIM) software that can push a computer's capacity. The RAM recommended for Revit ranges from 16 GB at the low end to 32 GB at the middle range (64 GB is their current top recommendation). A good mid-range is to have 32 GB of RAM (again 64 GB is better but more expensive). Having a faster CPU also makes a big difference with Revit. Recommended computer specifications for Revit can be found at this link: https://www.autodesk.com/support/technical/article/caas/sfdcarticles/sfdcarticles/System-requirements-for-Revit-2024-products.html

You can download Revit for free as a student at the Autodesk Student Community website https://www.autodesk.com/education/students.

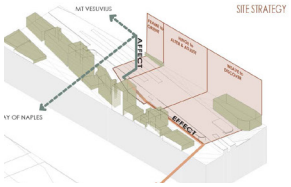
- Revit only runs on Windows.
- If you have a Mac you need to get Windows 11 installed on your Mac and run it through parallels.



INTRIGUE & ORIENT



CROSS THRESHOLD



APPROACH & INTRIGUE- FRAME 1

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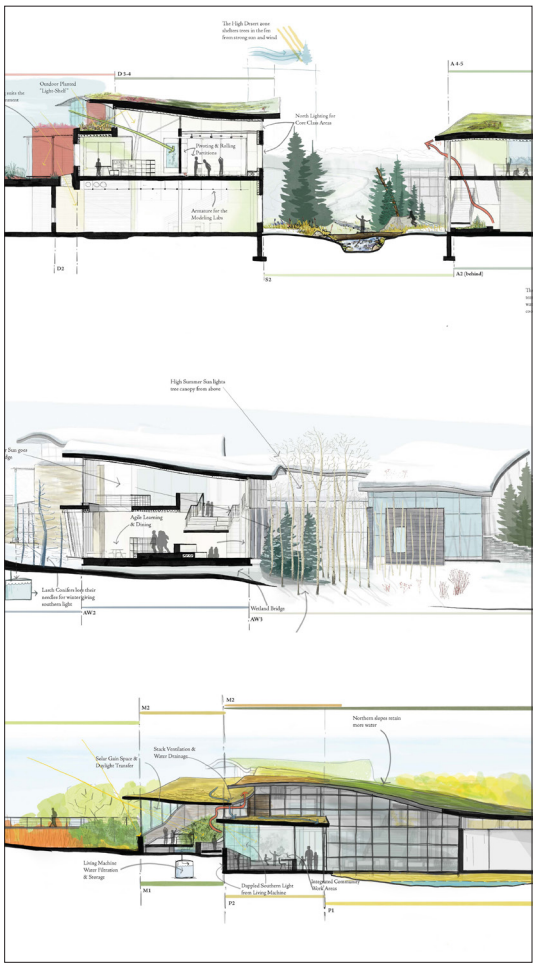
Third Year Software



Lumion and Enscape. These software programs provide real-time rendering views of your models in Revit, Rhino and SketchUp.

- Lumion and Enscape work only on the Windows operating system.
  - There are free student licenses for Lumion
  - Enscape has shifted to a monthly subscription rate for the student software..

- Lumion requires a discrete graphics card with 4–11 GB of VRAM, while Enscape requires a discrete graphics card that has between 2–8 GB of VRAM in order to create the real-time viewer. Both programs will create rendering in a very short period of time—often just minutes.
  - Lumion computer specifications
    https://lumion.com/requirements.html
  - Enscape computer specifications
    https://enscape3d.com/community/blog/knowledgebase/system-requirements/
  - Lumion also requires a certain power supply setting and provides information on the power supply needed
    https://support.lumion.com/hc/en-us/articles/360003476773-Which-power-supply-do-you-need-

- Enscape's hardware requirements are not quite as high as Lumion and while Lumion has a larger database of figures, plants, materials, vehicles, etc., Enscape will still produce good real-time rendered views and provides an easy interface into virtual reality images.

Summary

In many respects, Lumion's specifications are probably the highest. If your computer meets Lumion's specifications, it should run the rest of the software. Revit probably requires the next level of computer requirements. But as mentioned previously, all of this also needs to be factored into the budget that you have to purchase a computer.

If you have any questions on any of this please contact Steve Juroszek at stevej@montana.edu or Derek Jones at caaithelp@montana.edu