Suggested Laptop Computers for Incoming Physics Students

Overview & Suggestions

Class of 2028

PURPOSE:

This document outlines suggestions for a baseline laptop that could serve as a model for undergraduate students entering the Physics and Astronomy program in the Fall of 2024.

OVERVIEW:

Below are suggestions for PC and Mac models that incoming first-year students might purchase to enhance their learning experience. Software and applications are also suggested. Where applicable, shareware and other free, web-based sources are identified. Students could bring their laptops to class for use in a given experiment or access the software later for data analysis and reports.

In our University and College Physics classes students are frequently tasked with utilizing various software. This can involve a range of applications such as Vernier DataLogger, ioLab, and graphing or calculation software such as MS Excel. Reports are often written using MS Word. Presentations frequently utilize MS PowerPoint. All of this may be part of in-class activities and homework.

2024 PROCEDURE:

The general working approach to this survey was relatively informal. Required applications and PC capabilities are based on the overview of what a given instructor might expect a student to utilize for a given class. Classes were assumed to be those a student would take during their undergraduate career.

A benchmark set of laptops was considered. The desire was to identify something reasonably affordable from the low-to-mid range PC market. Suggested requirements are intended to align well with the intended software products students could be expected to use during their time at RIT. RIT-based outlets, such as the Digital Den, and outside vendors were all considered.

It was also assumed that such a computer purchase would be one-time and that the equipment would be with the student for a 4 to 5 year program. If upgrades were required, those would be modest and feature free or low-cost applications or hardware available to most students. Considerations for ADA utilization, modifications, and ease of use were also included in the search.

SUGGESTED EQUIPMENT 1:
GENERIC LAPTOP RECOMMENDATIONS

TABLE 1: General Requirements & Specifications

Laptop	Component	Minimum	Recommended	Notes
Generic Recommended Capabilities	Processor /Series	11th Generation i7 / AMD equivalent	11th to 13th Generation i7 / AMD equivalent or higher	
	Processor Specs	4 cores, 2 GHZ or higher	12 cores, 3 GHZ or higher	
	RAM	16 GB	32 GB	
	Video	Integrated graphics with high-end CPU	NVIDIA RTX 2/3xxx series, Quadro series, or Ampere series (at least 4 GB GDDR5), or equivalent AMD discrete graphics card	• For integrated graphics (non-card). • Either will provide better battery life
	Storage Drive	512 GB Solid State + External Storage	512 GB Solid State + External Storage – OR – 1 TB Solid State	
	Technical Support / Warranty	1-year Warranty + Accidental Damage. This comes standard with most PC laptop and MAC purchases. RIT students would do well with at least a 1-2 year warranty	4 years ProSupport+ Warranty (includes Accidental Damage Coverage; default for models bought through University Dell Webstore)	
	Operating System	Windows 10/11 Mac OS 11/12 Note: despite some student enthusiasm, current Linux distributions are not recommended	Windows 10/11 or Mac OS 11/12	Note: despite some student enthusiasm for UNIX/ Linux/RedHat, current Linux distributions or hobby installs are **not** recommended

SUGGESTED EQUIPMENT 2: PC Compatible

TABLE 2: 2024 "SoPA Dell" 1, 2, and 3 Model Laptops //
Reference Models are the Dell XPS 9530 14, 15, or 17-inch models

Laptop	Component	Minimum	Rationale	Additional Note
SoPA DELL-1	Memory	16GB 2x8GB DDR5 4800MHz		 DDR5 Memory Stack
	Processor	13th Gen Intel Core i9-13900HK (24MB Cache 5.4GHz)		Suitable for active video, graphics, simulations, applets
	Graphics	Intel Iris XE Graphics	Installed via graphics card firmware	No adapter or software installation required
	Screen	15.6 FHD+ (1920 x 1200) InfinityEdge Non-Touch Anti-Glare 500-Nit Display Intel(R)		
	Operating System	Windows 11 Home	Windows 10 or better	
	Misc 1	Killer Wi-Fi 6 1675 (AX211) 2x2 + Bluetooth 5.2 Wireless Card	WiFi & Driver pre-installed	
	Misc 2	Backlit Black English Keyboard		For low-light or lecture settings
	Misc 3	1-SD Card slot		Suggested for additional storage
	Misc 4	3.5mm headphone - microphone combo jack		
	Misc 5	Ports	2 Thunderbolt™ 4 (USB Type-C™) with DisplayPort and Power Delivery	Used for some peripheral equipment for in-class labs (Arduino, Raspberry Pi, M2K, Analog Discovery 2)
	SoPA Dell 1	Link to Dell XPS 14		$1799
	SoPA Dell 2	Link to Dell XPS 15 Laptop		$2100
	SoPA Dell 3	Link to Dell XPS 17 Laptop		$2799
	Avg Price:	$2200		**Avg price based on features selected for three standard models**

As this type of hardware and the component vendor(s) can be somewhat generic, it may be assumed that the hardware in Tables 1 and 2 are identical or relatively similar in performance and cost. These components are driven by industry standards and IEEE specifications, so there is limited variation.

SUGGESTED EQUIPMENT 3: Mac

TABLE 3: SoPA MAC 1 & 2 Model Laptops // Reference Apple MACBook Brand

SoPA MAC-1	SoPA MAC-2	Notes
Apple MacBook Pro M3	Apple MacBook Pro 16	Uses macOS. Comes with standard MS Office Suite. The MacBook offers speed with affordability.
14″ display M3 Pro chip processor and 16-core GPU 24GB unified memory 1TB SSD 3 USB-4/Thunderbolt ports HDMI port and SDXC card slot 1 headphone jack Link 	16″ Liquid Retina display M2 Max chip processor and 30-core GPU 36 GB unified memory 512GB SSD 4 USB-4/Thunderbolt ports HDMI port and SDXC card slot 1 headphone jack Link	 Students familiar with MAC will have no problem using these. There may be some compatibility issues with aspect ratio when using these with overhead projectors for presentations, but nothing that cannot be mediated. There are two recommended add-on desktop kits for expanded usage or ADA adjustments. It is suggested that students choose **one** of the following: • macOS Trackpad Kit with Magic TrackPad, Magic Keyboard, and 27” Samsung S60UA QHD Monitor • macOS Mouse Kit with Magic Mouse, Magic Keyboard, and 27” Samsung S60UA QHD Monitor
Est. Price: $2199	Est. Price: $2900	

Local Sources: BestBuy Henrietta, The Apple Store Eastview Mall

Online: Apple Store

SOFTWARE & SUNDRIES:

Below is a listing of software and applications that a Physics or Astronomy undergraduate might use during their career at RIT. These applications are based on feedback from instructors. Most of this software is used live in the workshops or as part of data analysis that is completed after a given experiment.

It should be noted that as a community RIT does a very good job providing applications for student use. Many instructors expressed concern over offering students costly software. In all cases faculty tend to promote and utilize shareware or software that is available to students, for free, via the Creative Cloud and the RIT Software Center.

All of the applications in Table 4 are used in our classrooms. The five laptops would work well with all of these. Students could run this software on their PCs during or after labs and activities.

TABLE 4: Software utilized as part of SoPA instruction

Software	Source & Cost	Cost*
MS Office Home & Student Suite	Included in cost of PC purchase	$80
MS OneNote	MS365 family of products. Allows 1TB storage per contract	~ $70 per year
Overleaf/LaTeX Editor		$129 for Personal license
Python	Anaconda / shareware	free/shareware including via RIT and online-python
ioLab	MacMillan Publishing	Free to students in our classes or via web emulator
Arduino	Arduino website	Shareware/free/web emulator
Vernier Logger Pro	Used with course instrumentation in CP1, CP2, UP1, UP2, and as demonstrations in other settings	Free to students in our classes or via web emulator
Scopy	Analog Devices	Free with hardware provided by SoPA for in-class use
Waveforms	Digilent	Free with hardware provided by SoPA for in-class use

CONCLUSIONS:

Overall, it is recommended that students begin their careers with RIT well-equipped to succeed in their classes. Part of that recommendation is that students who enter in the Fall of 2024 have on-hand one of the laptops listed in Tables 2 and 3. These machines represent commercially available state of the art components and offer a good mix of memory and speed that will allow access to a range of applications. If students wish to pursue the purchase of different models, the specification listing in Table 1 would serve as a good guide.

Software and teaching tools may be expected to evolve, and are likely to do so across a 4-5 year time span. The recommendations in this report keep that in mind. The laptop specifications are suitable for any new software an undergraduate would be expected to use. A laptop with the listed capabilities would also be able to utilize newer versions of the software listed in Table 4. Internet access for Zoom meetings and online resources such as web emulators for code (online-Python, ioLab, GitHub) should also be kept in mind when selecting a laptop model.

The great caveat to this report is the balance of costs and need to an individual. The purchase of a dedicated laptop that a student can use across 8 to 10 semesters, plus additional work for clubs, seminars, and co-ops, is a significant financial commitment. The listings for the suggested laptops are recommendations only.

Prices will change based on vendor, production levels, supply chain issues, and seasonal demand. If a student and their family wished to purchase another brand or a used system that is their choice. The specifications outlined in this document for memory, speed, and support equipment should be kept in mind as the student looks for resources to make their undergraduate career a success.