

GE-161L

Introduction to Information and Communication Technologies

Laboratory 04

Computer Troubleshooting

and

Computer Ergonomics

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Learning Objectives:

- Quick Fixes
- Computer Troubleshooting
- Computer Ergonomics

Resources Required:

- Laptop or Desktop Computer

General Instructions:

- This is an individual lab, you are strictly **NOT** allowed to discuss your solution with your colleagues, even not allowed to ask how is he/she is doing, may result in negative marking. You can **ONLY** discuss with your TAs or with me.
- Your TAs will be available in the lab for your help. Alternatively, you can send me your queries via email.

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Background and Overview:

Troubleshooting:

Troubleshooting is a form of problem solving, often applied to repair failed products or processes on a machine or a system. It is a logical, systematic search for the source of a problem in order to solve it, and make the product or process operational again. Troubleshooting is needed to identify the symptoms. Determining the most likely cause is a process of elimination—eliminating potential causes of a problem. Finally, troubleshooting requires confirmation that the solution restores the product or process to its working state (Wikipedia). Following diagram shows a general flowchart of troubleshooting process.

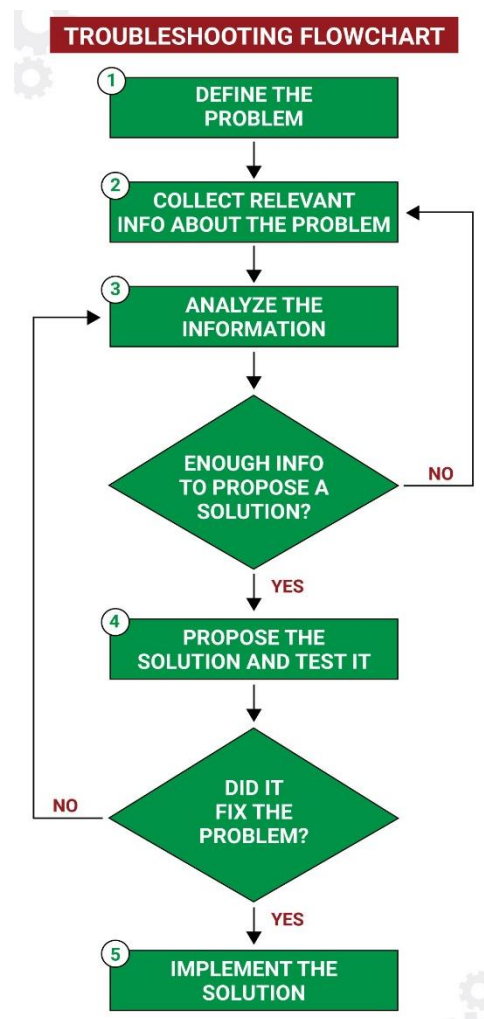


Fig. 1 (Troubleshooting Flowchart)

Computer Troubleshooting:

Computer Troubleshooting is the process of diagnosing the source of a problem. It is used to fix problems with hardware and software. The basic theory of troubleshooting is that you start with a problem, and then narrow it down to more specific issues.

Ergonomics:

Generally speaking, ergonomics is defined as the study of how people work in their environment. Many people spend hours a day in front of a computer without thinking about the impact on their bodies. They physically stress their bodies daily without realizing it by extending their wrists, slouching, sitting

without foot support and straining to look at poorly placed monitors. These practices can lead to cumulative trauma disorders or repetitive stress injuries, which create a life-long impact on health. Symptoms may include pain, muscle fatigue, loss of sensation, tingling, and reduced performance.

Ergonomics is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.

Computer Ergonomics:

Computer ergonomics addresses ways to optimize your computer workstation to reduce the specific risks of computer vision syndrome, neck and back pain, and backache. In some cases, it can even lead to poor digestion, headaches, repetitive stress injury and vision problems. It also reduces the risk of other disorders affecting the muscles, spine, and joints.

Computer Vision Syndrome: Computer vision syndrome refers to a group of eye and vision-related problems that result from prolonged computer use. Symptoms of computer vision syndrome include the following:

- **Dry Eyes:** Just like other digital devices, computers can cause dry eyes, as they can affect the way we blink. According to the University of Iowa Hospitals and Clinics, a person blinks up to 66 percent less frequently while using a computer. If you are blinking less, tears on your eyes have more time to evaporate, resulting in red and dry eyes. This can even cause blurred vision in some cases.
- **Eyestrain:** Eyestrain can occur when we force our eyes to focus in an unhealthy, unnatural position. For example, if our monitor is placed at an awkward angle or too low, our eyes are forced to stay in an unnatural position. These awkward postures strain the eye muscles and can cause pain and aching.
- **Blurred Vision:** Blurred vision is commonly caused by looking at a screen that is too bright or sitting too close to a monitor. It can also be caused by looking at a screen for long without adequate breaks.
- **Headaches:** Headaches are a common complaint from people who spend prolonged periods sat at a computer. Headaches can occur due to poor lighting in your workspace, glare on the screen, improper computer brightness and color. Headaches can also be caused by eye strain. Our eyes are more comfortable resting at a point that is further away from the screen. When we look at a computer, our eye muscles have to constantly readjust focus between the RPA and the front of the screen. When there is a conflict between where our eyes want to focus and where we force them to be focused can lead to strain and the eyes become tired. This can often be the cause of our office headache.
- **Neck and Back Pain:** Workers often adopt to a certain position to see the screen better. Straining your muscles to look at a computer is a common cause of back and neck ache, as your body forced into an unnatural position. This is particularly a problem when people find themselves looking down to see their computer screen rather than adjusting the monitor to match their eye level.
- **Carpal Tunnel Syndrome:** Carpal tunnel is a condition that causes pain, numbness, and tingling in the hand and arm. It causes when one of the major nerves to the hand – the median nerve, is squeezed or compressed as it travels through the wrist. This is commonly caused by the wrong mouse and keyboard placement.

Computer Ergonomics Recommendations

- **The Correct Monitor Height and Placement:** Placing your computer monitor so it is not level with your eyeline is a common cause of computer vision syndrome and back and neck injury.

To avoid health issues and screen glare, position computer monitors and display screens so they are:

- level with your eyeline to prevent neck and back pain
- around an arm's length away from your body to prevent computer vision syndrome

If you struggle to place your computer in the right position for your eyeline, you may benefit from an adjustable monitor arm. Using an adjustable monitor arm can help promote and enhance comfort and performance, minimizing health risks.

- **Reduce Screen Glare:** To prevent headaches and computer vision syndrome, you should ensure you adjust your monitor so that its brightness is approximately equal to the area behind it. If you find yourself experiencing computer vision frequently, it may be time to adjust your computer screen brightness. If you still experience screen glare, you can cover your computer with an anti-glare filter and wear anti-glare glasses.
- **The Correct Mouse Placement:** The mouse should be positioned so it keeps your arms at or below a 90-degree angle. Your wrists should not be straining, nor should they feel uncomfortable during use.
- **The Correct Keyboard Placement:** Ergonomic experts recommend placing a keyboard just below elbow level. Your keyboard should be flat on the desk, or gently sloping away from you. You should position your keyboard so your elbows and arms remain as close to your sides as possible. Your arms should sit at or below a 90-degree angle. If you struggle to maintain the correct keyboard placement and work comfortably, an ergonomic keyboard should be used to achieve a negative tilt. This means the keyboard will be sloping down and away from you, so your arms and hand follow the downward slope of your thighs.
- **Keep Key Objects Close to You:** You should organize your ergonomic computer workstation so that key objects are close to you. This could include your phone, notebook, water bottle and any other essential items. This will prevent unnecessary reaching and straining.
- **Use a Hands-Free Headset When Talking on The Phone:** Using a hands-free headset can prevent strains from placing our hands in the same position frequently when we answer the phone. It can also prevent shoulder pain if we avoid tucking the phone between our shoulders and ears, which is a common mistake.
- **How do you know if your desk is at the right height?** You can check your desk is at the right height by resting your arms at your sides in your seating position at your desk. Keep your elbow at a 90-degree angle and your upper arms in line with your torso. Your hands should be rested comfortably on your desk if your desk is at the right height.
- **What is computer desk lighting ergonomics?** Ergonomic lighting is often ignored in an office, leaving employees to work under harsh, bright lighting. Poor lighting can contribute to headaches, eye pain, tiredness, and un-productivity. Computer desk lighting ergonomics ensures a person is working under lighting that is adequate and not too bright or faulty.
- **What are the benefits of a standing from worksite briefly?** Frequently lifting from your chair and moving around for a couple of seconds may help is overall body blood flow and relaxing body muscles. This can provide the following benefits:
 - Standing can reduce back and neck pain as it provides the chance to stretch your muscles
 - Standing frequently can help improve mood and energy levels
 - Combining standing and sitting throughout the day can reduce the risk of leg aches and cramps

Activities:

Pre-Lab Activities:

Quick Fixes

When something unexpected happens on your computer consider a few quick fixes.

Check Windows Update:

- Open the Settings app: Press the **“Windows + I”** keyboard shortcut
- Click on **“Update & Security”**

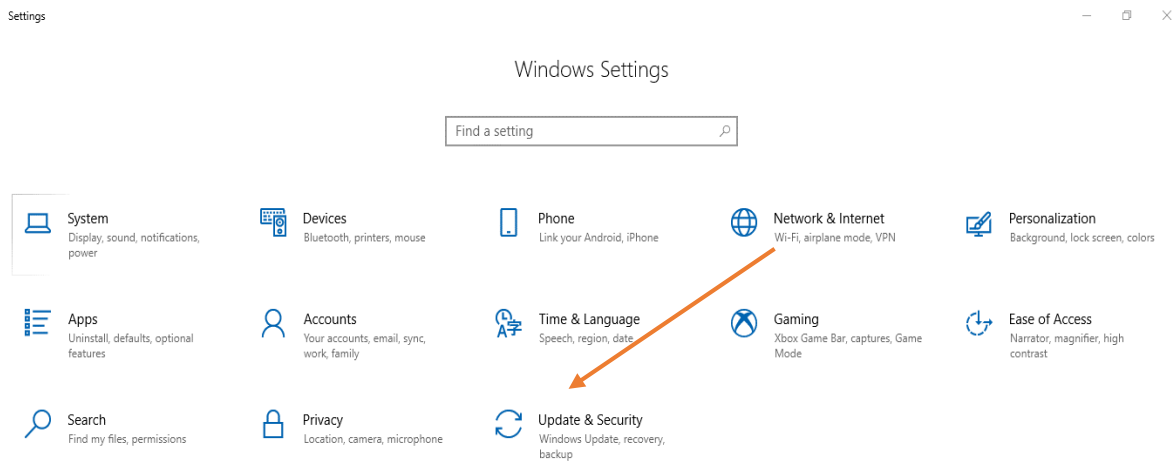


Fig. 2 (Settings App)

- Under **“Windows Update”** Click on **“Check for updates”**

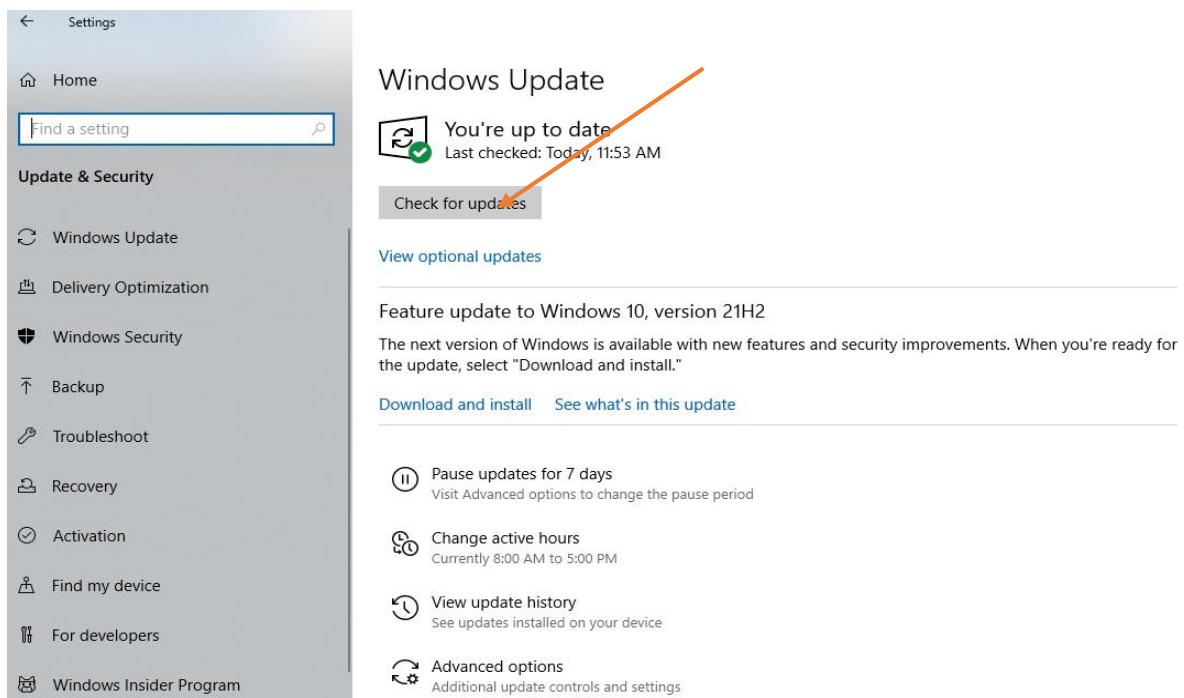


Fig. 3 (Settings App)

- The update will be started if any

Restarting the PC:

- Close all programs
- Press the **“Windows key”** to open the start menu
- On the start menu, click the **“Power”** icon on the bottom left corner

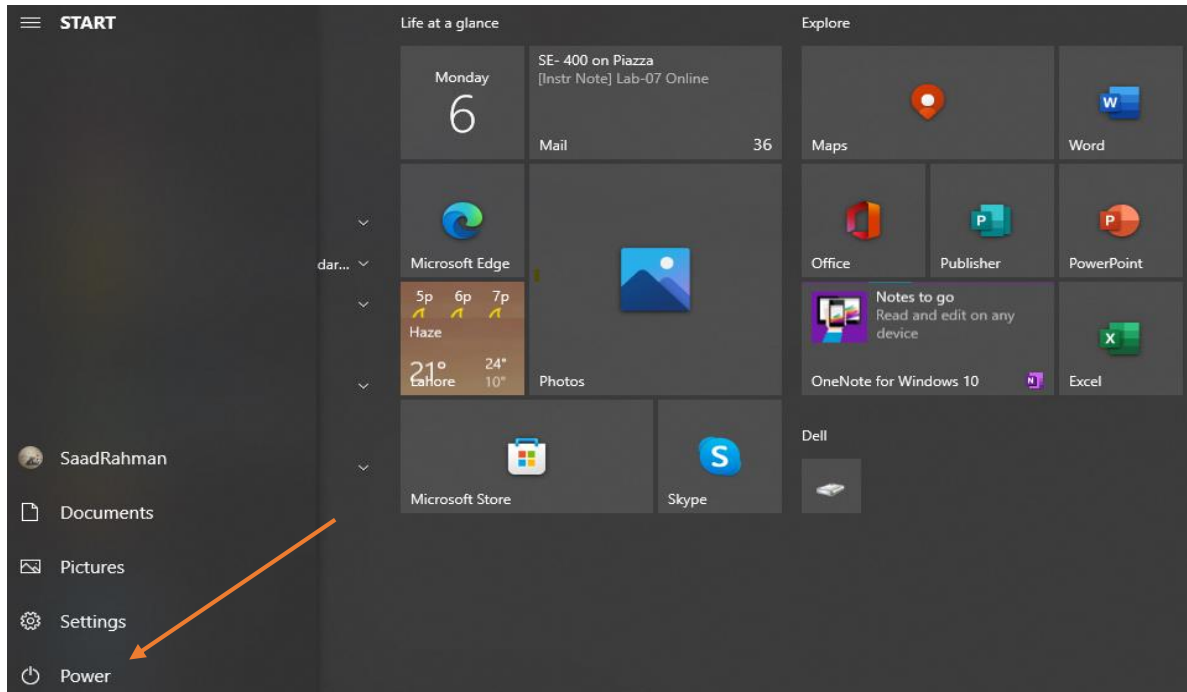


Fig. 4 (Start Menu)

- Select **“Restart”** from the Power menu

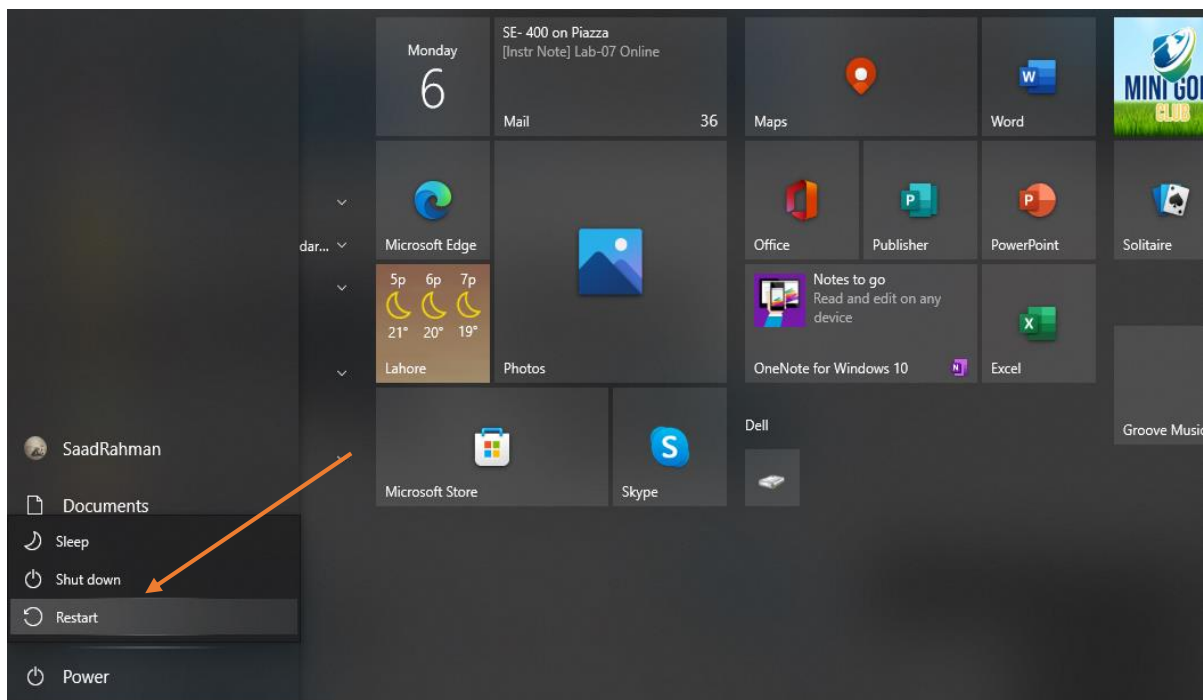


Fig. 5 (Start Menu)

- If any program remains open press the **“Restart anyway”** button

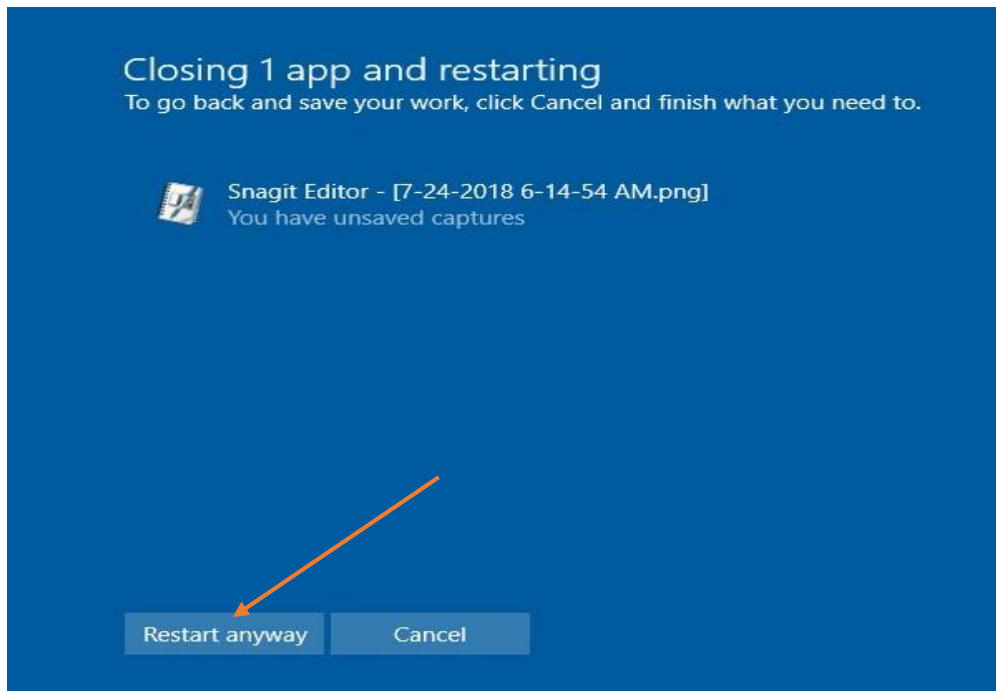


Fig. 6 (Force Restart Menu)

- If the computer doesn't obey your directions:
 - Press and hold the **"Power button"**
 - Keep holding it until your PC turns off

In-Lab Activities:**Power On****Symptom:**

When you press the power button of your PC and the PC remains off.

Troubleshooting:

- Check the power supply from the socket
- Check if the power supply properly connected to the main circuitry of the PC
- Check monitor is turned on
- Check all cables are connected externally

Power-On Self-Test (POST)**Symptom:**

Beep Patterns.

Troubleshooting:

- Remove newly added hardware
- Remove any disks or USB devices
- Disconnect external devices
- Identify **beep patterns** (Link for identification is provided in “**References and Additional Material**”)
- Check all cables
- Disconnect all drives
- Disconnect and reconnect the CPU

The search of Operating System**Symptom:**


A computer can't find the Operating system. One of the following texts will appear on the screen:

- Invalid Partition Table
- Missing Operating System
- Operating System Not Found

Troubleshooting:

Perform Startup Repair by accessing Windows Recovery Environment.



- Press “ (WIN) + I” to open the settings app
- Choose “**Update & Security**”

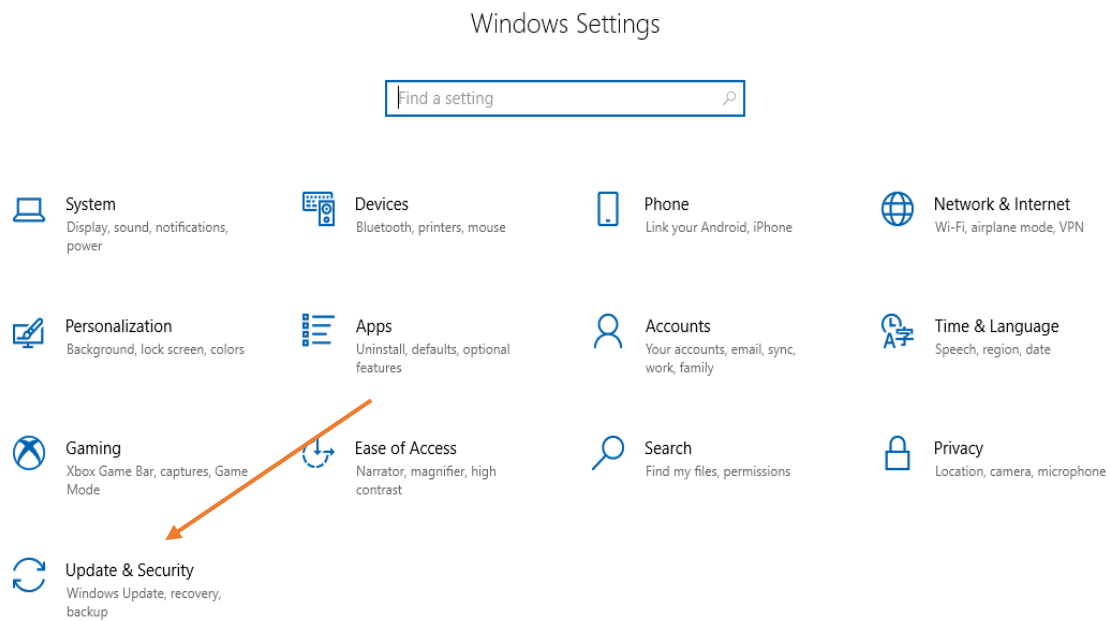


Fig. 7 (Settings App)

- Select the **“Recovery”** category on the left side of the window

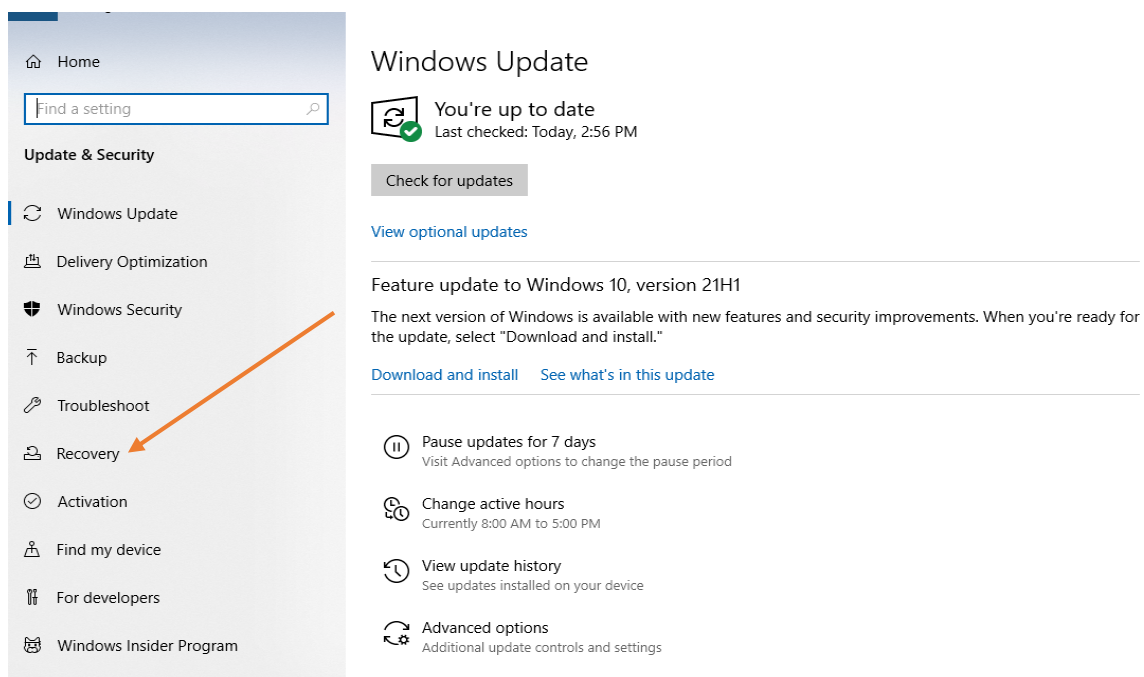


Fig. 8 (Settings App)

- Under **“Advanced Setup”** click the **“Restart now”** button

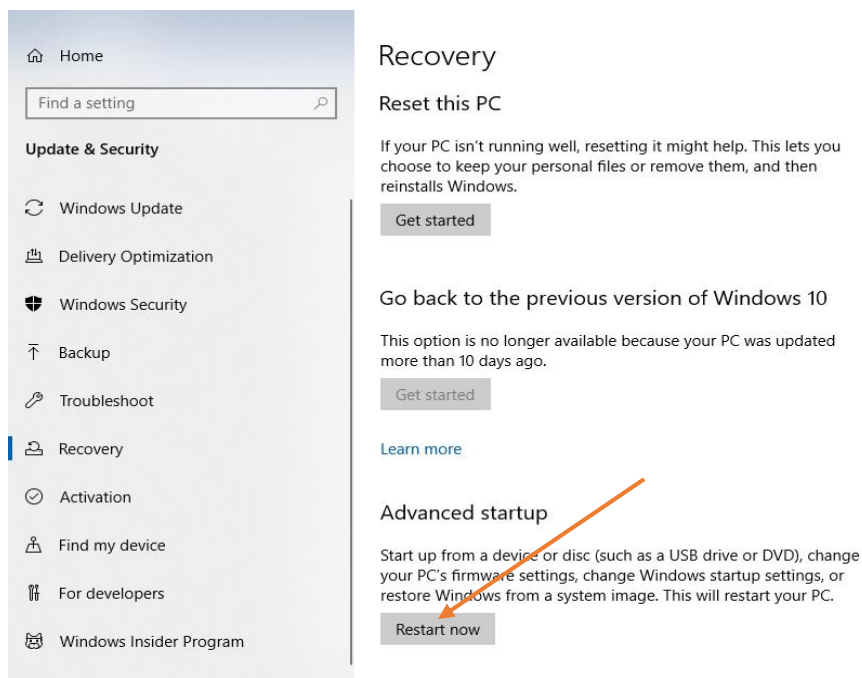


Fig. 9 (Recovery-Settings App)

The PC restarts and you will see the main screen of Windows Recovery Environment.

- Under **“Choose an option”** select **“Troubleshoot”**

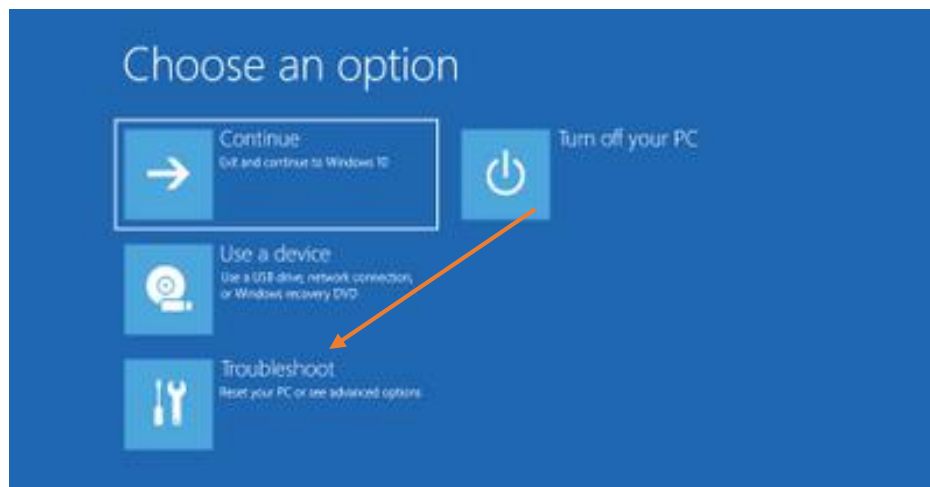


Fig. 10 (Windows Recovery Environment)

- Under **“Advanced options”** select **“Startup Repair”**

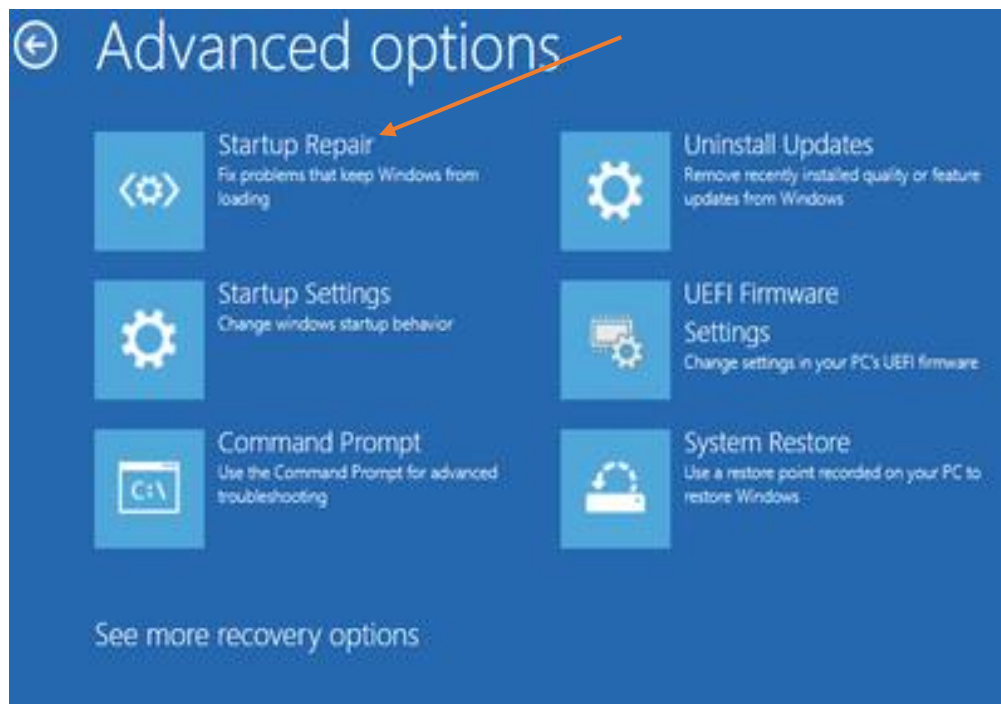



Fig. 11 (Windows Recovery Environment)

Saving Eyes

- Press “ (WIN) + I” to open the settings app
- Choose “**System**” tile

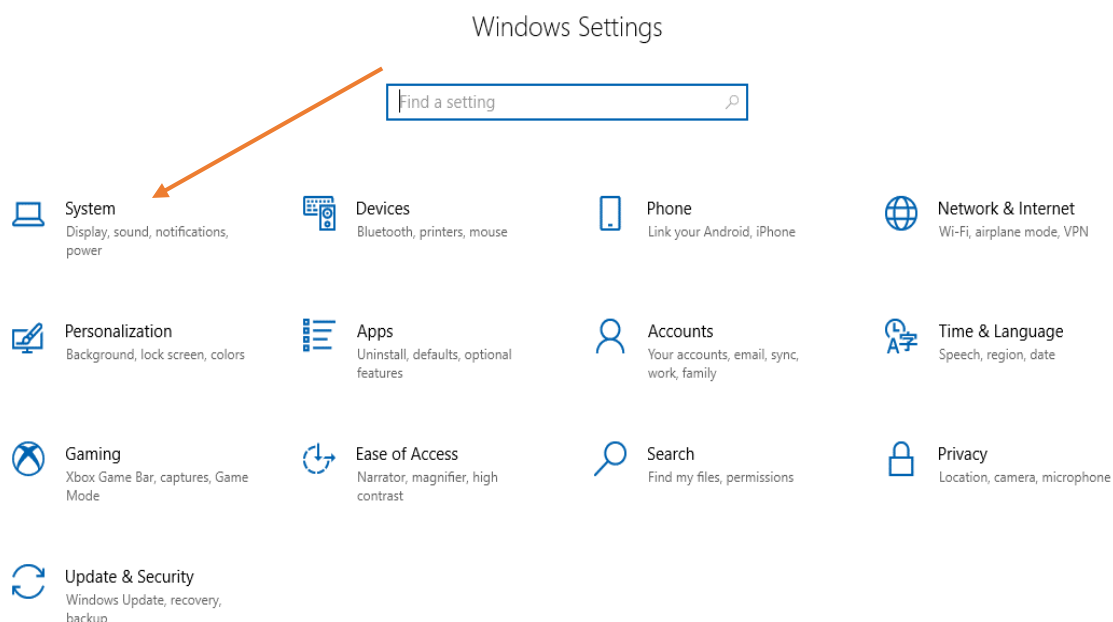


Fig. 12 (Settings App)

- Click the “**Night light settings**” link

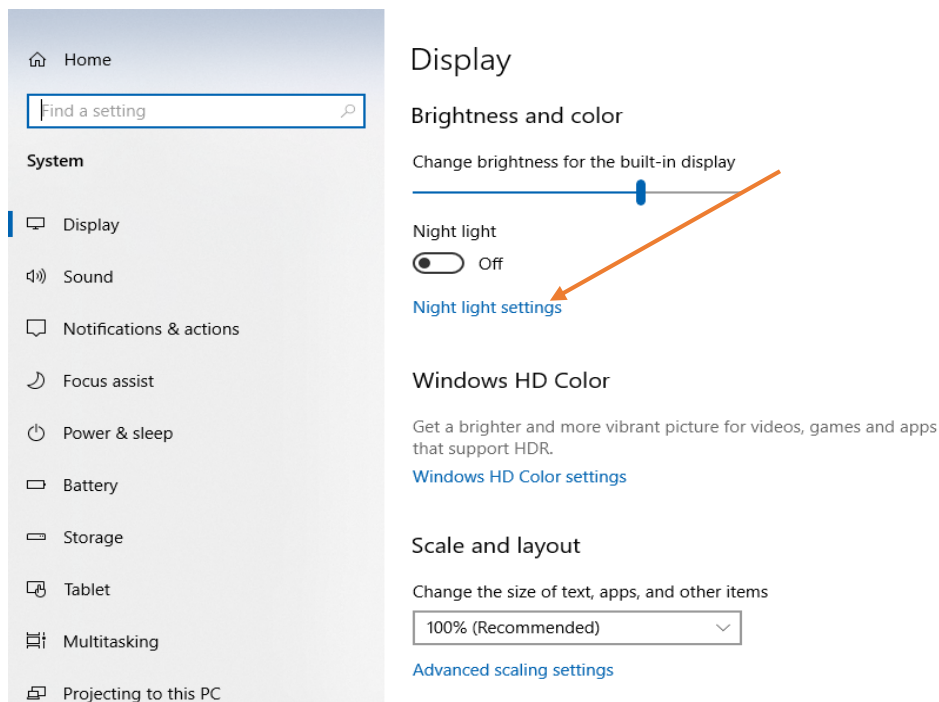


Fig. 13 (Display-Settings App)

- Turn on the “**Schedule night light**” and set the schedule for the night light

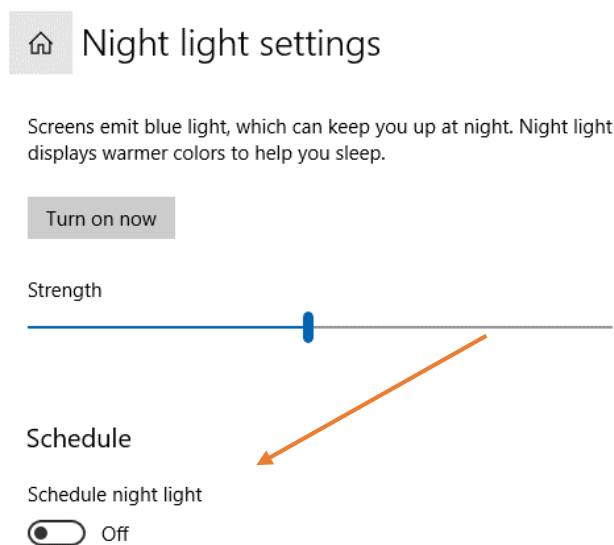


Fig. 14 (Night Light-Settings App)

Audio

Symptom:

No sound is produced.

Troubleshooting:

- Click the taskbar volume icon and increase or unmute the volume



Fig. 15 (Audio icon -Taskbar)

- Ensure speakers are turned on
- Reconnect the speakers
- Unplug headphones if they are connected to your PC
- Turn off your PC, and reconnect the speakers

Display

Symptom:

The screen is blank.

Troubleshooting:

- Press any key or move the mouse to make the screen display visible again
- Press the **“Power on”** button to turn on the PC

Keyboard

Symptom:

Keyboard typing or commands not recognized by the PC.

Troubleshooting:

- Check if the keyboard is connected
- Reconnect the keyboard
- Turn off PC:
 - Turn off the PC using a mouse
 - Reconnect the keyboard
 - Turn on the PC

Mouse

Symptom:

The cursor does not respond to mouse movement.

Troubleshooting:

- Check if the mouse is connected
- Reconnect the mouse
- Check if the mouse is on a stable surface
- Check if the wire of mouse damaged
- Restart PC using the keyboard:
 - Press the **“Alt + Tab”** keys on the keyboard at the same time to navigate to an open application
 - Press the **“Ctrl + S”** keys on the keyboard at the same time to save your changes in the selected application

- After saving changes in all open applications, press the **“Windows key”** on the keyboard to display the **“Start menu”**
- Press the **“Tab key”**. Then use the **“down arrow key”** to select the **Power icon**, and then press the Enter key on the keyboard
- From the **“down arrow key”** select **“Shut down”**
- After the PC turns off, reconnect the mouse and turn on the PC again.

Symptom:

The cursor moves too fast or slow.

Troubleshooting:

- Change Cursor Speed:
 - Open the Settings app: Press the **“Windows + I”** keyboard shortcut
 - Click on **“Devices”**

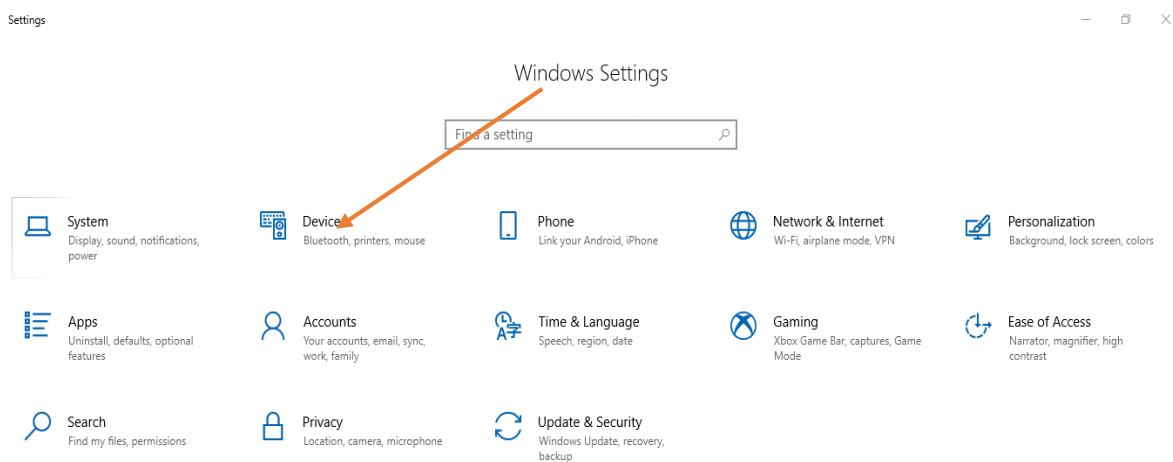


Fig. 16 (Settings App)

- From the sidebar click on **“Mouse”**

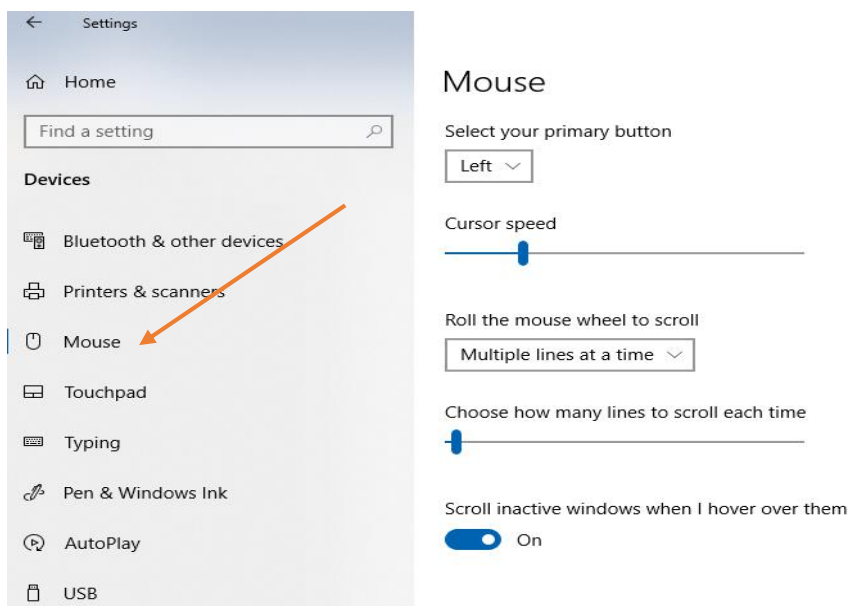



Fig. 17 (Mouse-Settings App)

- Adjust the slider under the **“Cursor Speed”**

Running a Troubleshooter:

- Open the Settings app: Press the “ (WIN) + I” keyboard shortcut
- Click on **“Update & Security”**

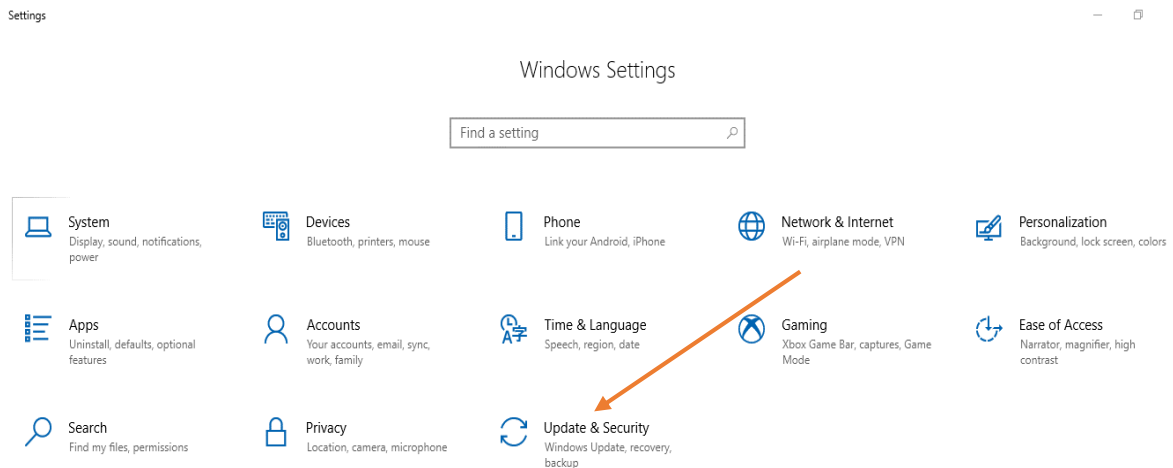


Fig. 18 (Settings App)

- From the sidebar click on **“Troubleshoot”**

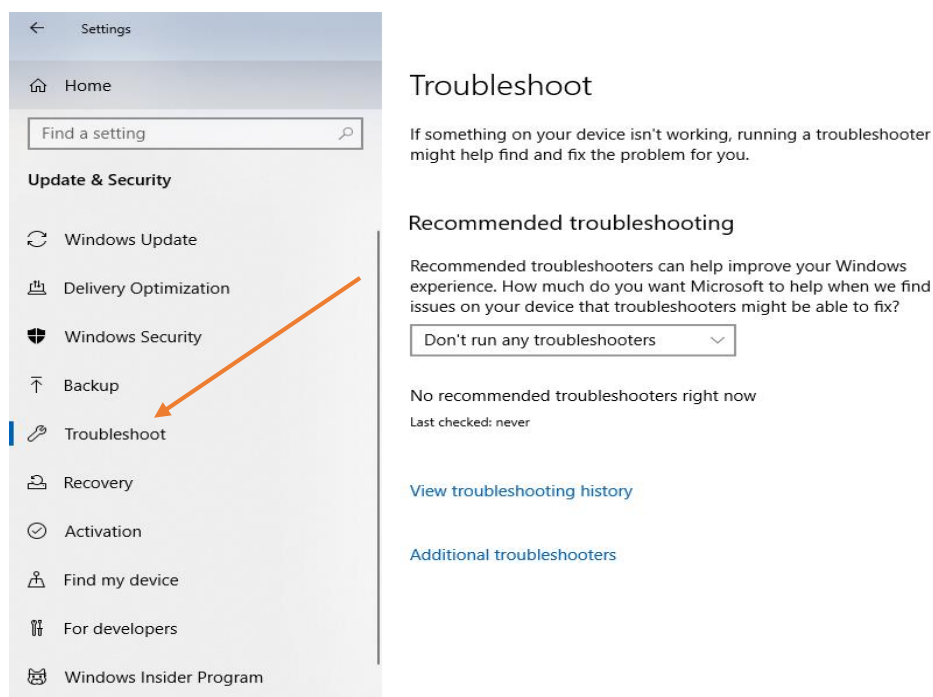


Fig. 19 (Troubleshoot-Settings App)

- Click on **“Additional troubleshooters”**

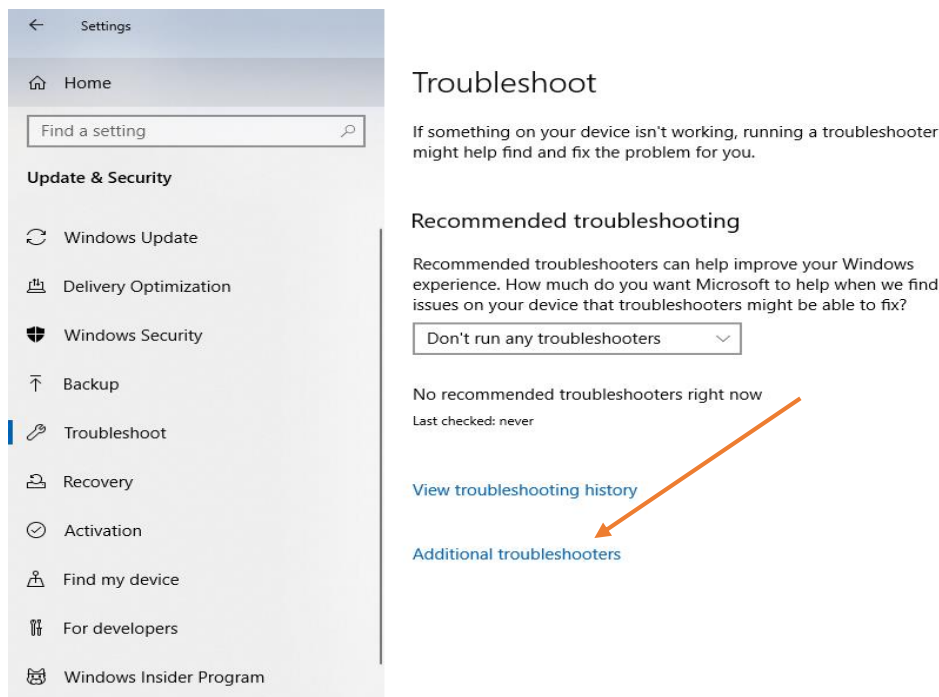


Fig. 20 (Troubleshoot-Settings App)

- From the listed options select the item you want to troubleshoot
- Click on **“Run the troubleshooter”**

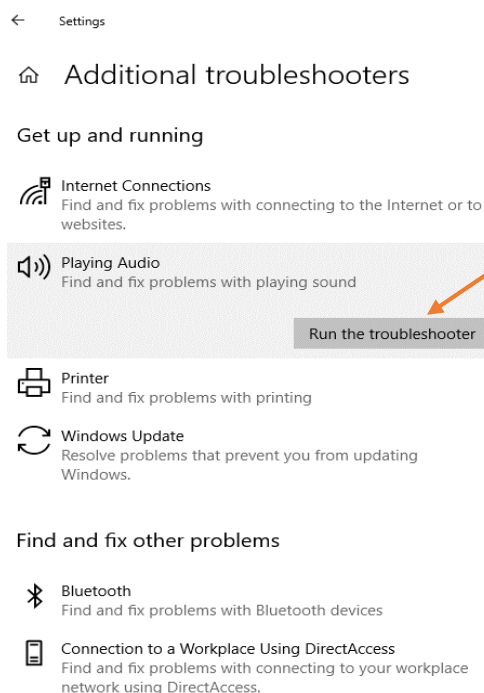


Fig. 21 (Troubleshoot-Settings App)

Task Manager

Switching Tasks:

- Press “**Ctrl + Shift + Esc**” to open Task Manager
- Open the “**Processes**” tab

Name	Status	8% CPU	57% Memory	7% Disk	0% Network	4% GPU	GPU engine
Apps (6)							
> Google Chrome (11)		0.1%	231.1 MB	0 MB/s	0 Mbps	0%	GPU 0 - 3D
> Microsoft Word (32 bit)		0.4%	74.9 MB	0 MB/s	0 Mbps	0%	
> Settings		0%	0 MB	0 MB/s	0 Mbps	0%	GPU 0 - 3D
> Snipping Tool		0.3%	1.8 MB	0 MB/s	0 Mbps	0%	
> Task Manager		0.6%	25.2 MB	0 MB/s	0 Mbps	0%	
> Windows Explorer		0.5%	42.3 MB	0 MB/s	0 Mbps	0%	
Background processes (106)							

Fig. 22 (Task Manager)

- Under “**Apps**” double click the program you want to switch with

Examining Processes:

- To see what’s making the PC run slowly, use the **CPU column** to sort the under “**Details**” list. Ensure that items consuming CPU time appear at the top of the list. One of them may be the culprit that’s consuming all the PC’s power

Name	PID	Status	User name	CPU	Memory (a...
System	4	Running	SYSTEM	04	20 K
WINWORD.EXE	11452	Running	SaadRahm...	04	74,504 K
Taskmgr.exe	9636	Running	SaadRahm...	02	24,160 K
SnippingTool.exe	3816	Running	SaadRahm...	02	2,684 K
explorer.exe	9912	Running	SaadRahm...	02	41,944 K
chrome.exe	15784	Running	SaadRahm...	00	64,676 K
csrss.exe	13836	Running	SYSTEM	00	972 K
DSASvc.exe	5228	Running	SYSTEM	00	11,384 K
svchost.exe	4048	Running	LOCAL SE...	00	3,804 K
svchost.exe	2008	Running	SYSTEM	00	91,344 K
ctfmon.exe	13096	Running	SaadRahm...	00	2,684 K
TextInputHost.exe	11320	Running	SaadRahm...	00	3,300 K
smss.exe	17402	Running	SYSTEM	00	20,000 K

Fig. 23 (Task Manager)

- Multiple entries might indicate the presence of malware. But some processes have multiple entries, so for them, it's not a sign of trouble
- Sort the list by the username to view which processes were started by Windows (SYSTEM), which are owned by your account, and which belong to other owners

Ending a stuck program:

- Press “**Ctrl + Shift + Esc**” to open Task Manager
- Open the “**Processes**” tab
- Select the non-responsive program
- Click on “**End Task**” at the bottom right corner

File Options View									
Processes Performance App history Startup Users Details Services									
Name	Status	8% CPU	53% Memory	2% Disk	0% Network	1% GPU	GPU engine	Power usage	Power usage t...
Apps (6)									
Google Chrome (11)		0.1%	133.4 MB	0 MB/s	0 Mbps	0%	GPU 0 - 3D	Very low	Very low
Google Chrome		0%	43.6 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Google Chrome		0%	1.7 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Google Chrome		0%	2.4 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Google Chrome		0%	1.8 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Google Chrome		0%	4.7 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Google Chrome		0%	13.9 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Google Chrome		0%	1.5 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Google Chrome		0%	2.0 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Google Chrome		0%	1.5 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Google Chrome		0%	1.4 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Google Chrome		0.1%	58.9 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Microsoft Word (32 bit)		0.8%	96.9 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Settings		0%	18.5 MB	0 MB/s	0 Mbps	0%	GPU 0 - 3D	Very low	Very low
Settings		0%	18.5 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Snipping Tool		0.4%	2.7 MB	0.1 MB/s	0 Mbps	0%		Very low	Very low
Task Manager		1.0%	23.4 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Task Manager									
Windows Explorer		0.4%	44.9 MB	0 MB/s	0 Mbps	0%		Very low	Very low
Downloads									
Background processes (102)									
Fewer details									
									End task

Fig. 24 (Task Manager)

Computer Ergonomics

Adjusting your chair:

- Adjust your chair to a comfortable height with your feet flat on the floor
- If you are unable to adjust the chair so that your feet are flat on the floor, you may need a footrest
- Adjust your backrest height so that it fits the small of your back and feels comfortable
- Adjust your backrest to tilt in or out to support your body in an approximately upright position
- Set your seat pan depth and angle so there is no pressure on the back of your knees or thighs
- Adjust the armrests to support your forearms with the shoulders in a relaxed position



Fig. 25 (Chair)

Adjusting your workstation:

- Position the monitor at an appropriate reading distance for eye comfort. This is usually with your eyes at or just below the top of the screen. Bifocals - adjust the screen to read through the upper or lower part of your glasses keeping a comfortable position
- Place documents at about the same distance and height as your monitor

- Move your hands and arms freely while keying. Rest on a wrist rest only between keying
- Position your keyboard to a height and angle where you are comfortable and your wrists are in an approximately straight position
- Adjust your work surface to elbow level for keying
- Place your mouse at elbow height keeping your wrist relatively straight. It should be close enough to use without reaching or stretching
- Adjust your workstation height and depth to make adequate room for your legs

Maintain Neutral Posture:

- Keep your head balanced over your shoulders and hips
- Relax your arms and shoulders
- Relax your fingers in a curved position while keying
- Support your spine in a slightly arched position with the back of the chair
- Place your elbows comfortably at your sides with your forearms horizontal
- Your hands and arms should move freely over the keyboard with your wrists in a relatively straight position
- Position your knees at the same level or slightly lower than your hips
- Support your feet comfortably on the floor or footrest in front of the knees

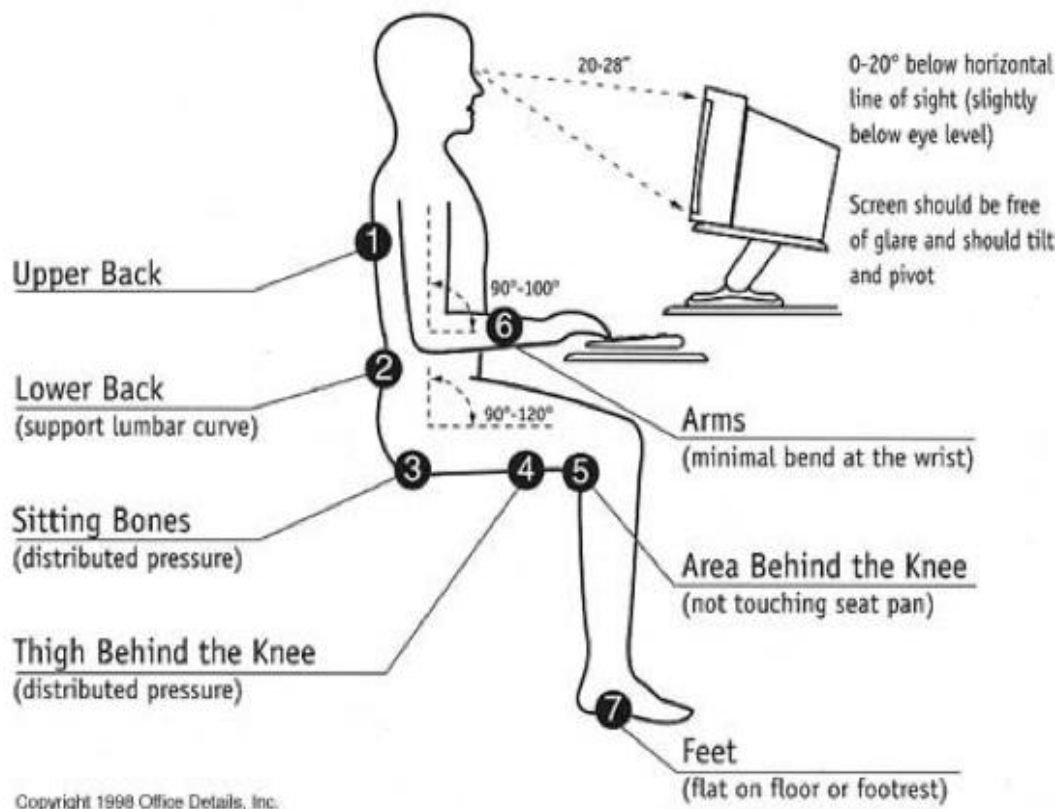


Fig. 26a (Ergonomic Positions)

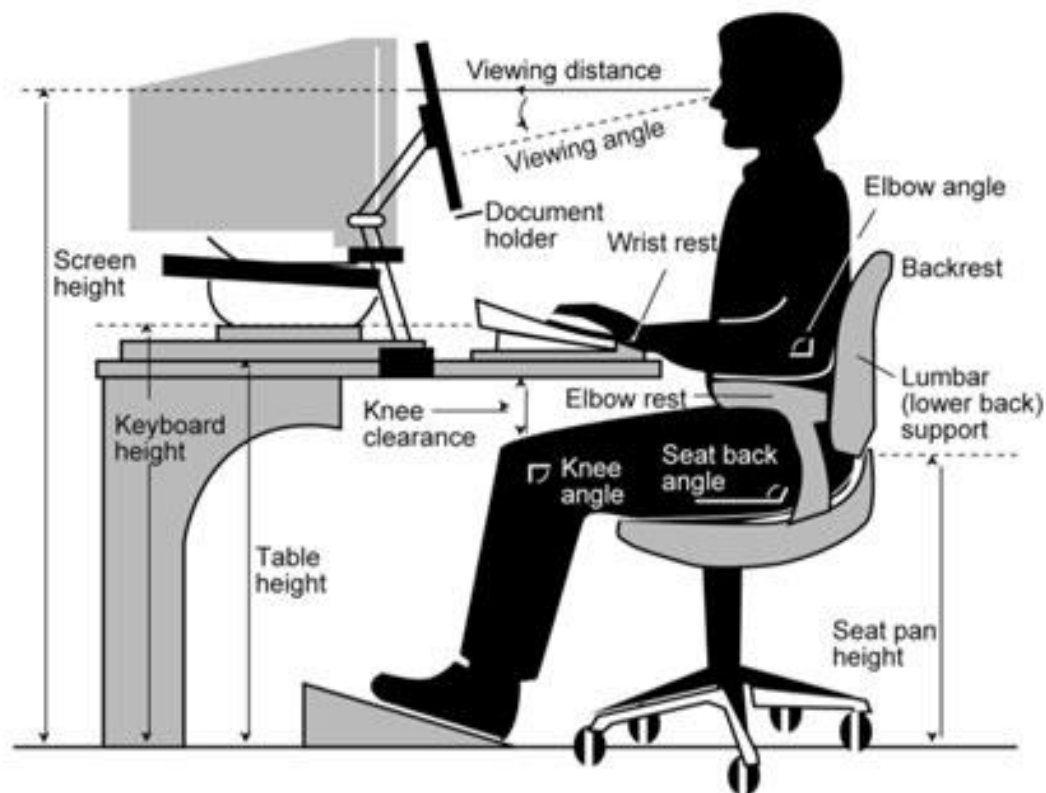
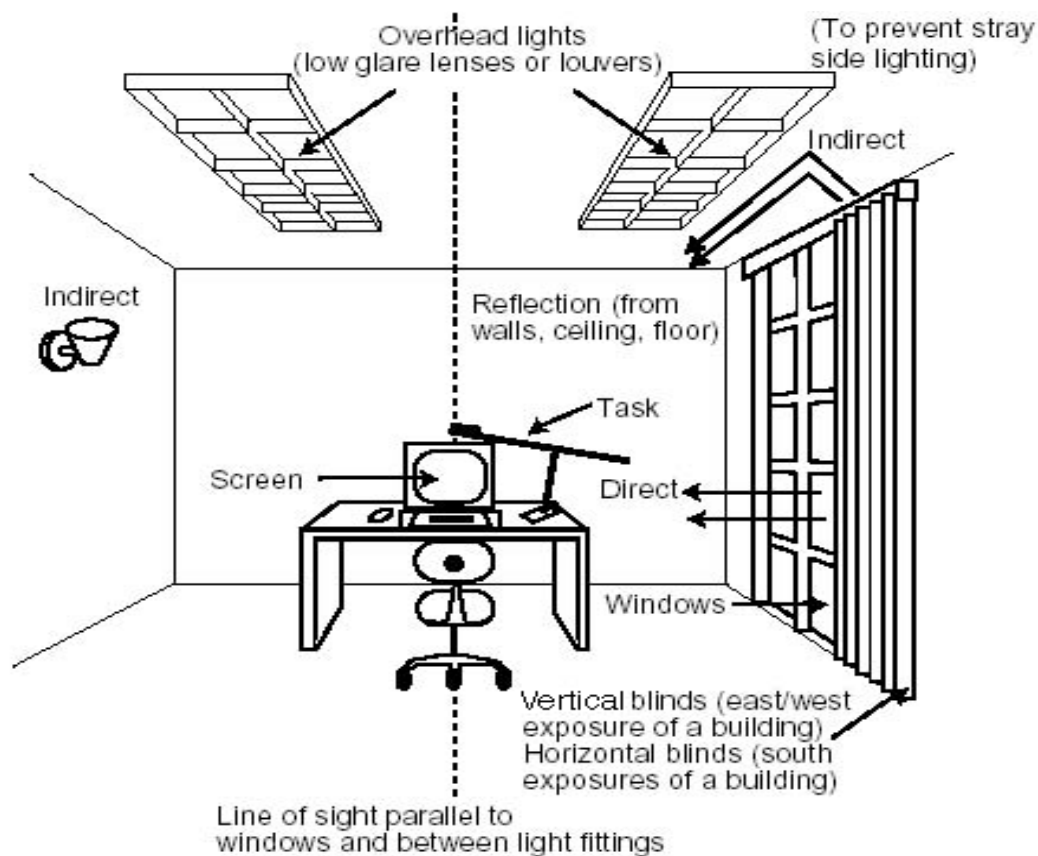


Fig. 26b (Ergonomic Positions)

Lighting:

- Lower the total light levels whenever possible to reduce glare on your computer screen, i.e., remove or turn off some overhead lighting
- Avoid placing your monitor directly under cabinet task lights
- Position your screen at a right angle to a window that is producing glare
- Close shades, curtains, or blinds on windows producing unwanted light or glare
- Adjust your monitor display contrast and brightness to improve viewing comfort
- Clean your screen periodically to maximize clarity
- Characters on your screen should be clear



Positoning a Workstation Among Various Light Sources

[Source: OSHA]

Fig. 27 (Workstation in Light Sources)

Vision Care:

- Adjust the computer monitor so that the top toolbar on your screen is at or slightly below eye level
- Place your screen at the appropriate reading distance for your eyes
- Use a document holder to place documents at approximately the same height as the monitor or, if possible, directly in front of you
- Regularly clean your monitor screen
- Frequently change focus from your work to an object at least 20 feet away

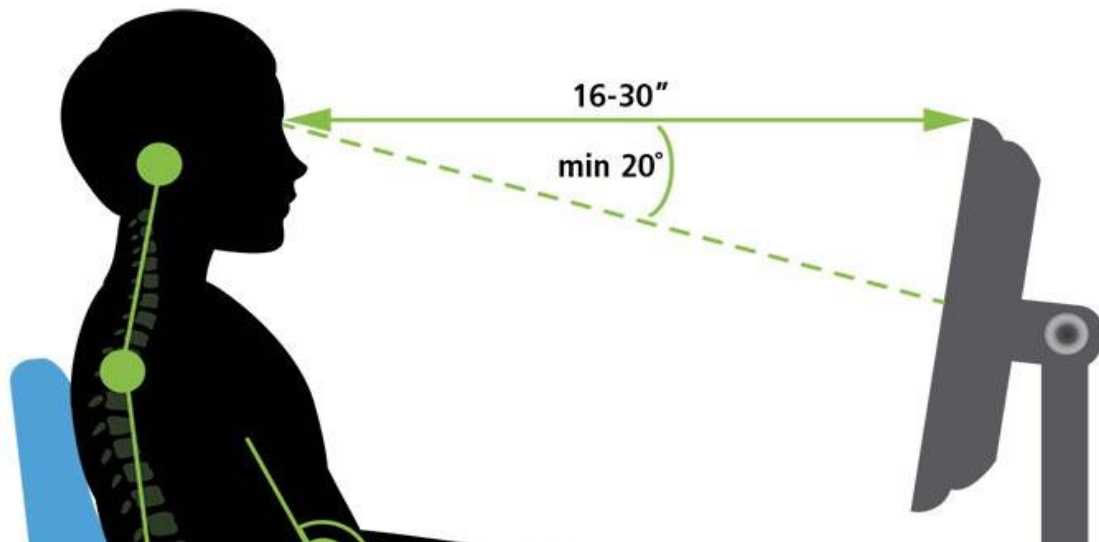


Fig. 28 (Vision Angle)

Laptop Tips:

- Use an external mouse and keyboard if working at home or other convenient locations
- Arrange your workstation and computer as close as possible
- Find a comfortable position that places the laptop screen as close to eye level as possible and your arms in a comfortable neutral position
- Eliminate glare where possible by using shades, turning off extra lights, or changing positions
- Stretch often, especially if working in awkward space such as an airplane or a hotel room
- Use proper lifting techniques when moving the laptop and other equipment, especially in and out of vehicles

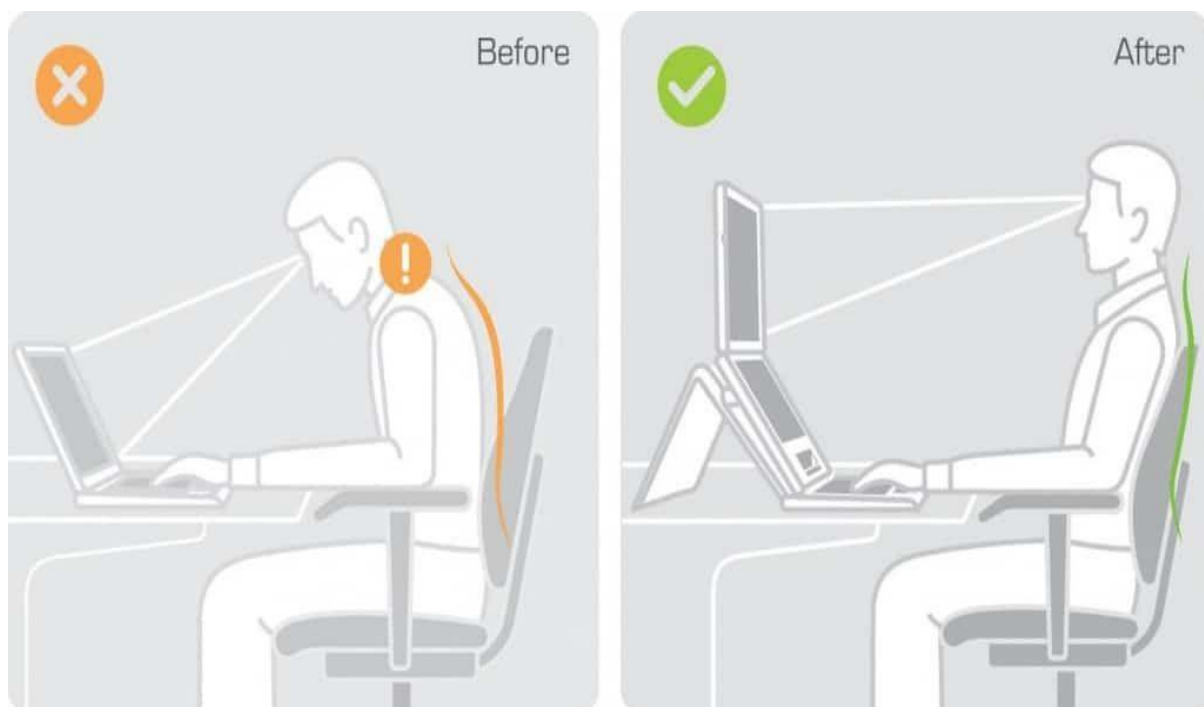


Fig. 29 (Laptop Position)

Task 01: Quiz**[15 minutes / 10 marks]**

A short MCQ's type quiz on troubleshooting.

Task 02: Changing Cursor speed.**[10 minutes / 15 marks]**

Change the Cursor Speed of your computer to **"10"**.

Task 03: Analyzing Ergonomics**[25 minutes / 25 marks]**

- Analyze your laboratory environment
- Create a text file name **"Your Roll No"**
- Write ergonomic improvements in the laboratory
- Send the file to the respective TA via email

Post-Lab Activities:**Task 01: Shutdown Issue****[estimated 60 minutes / 30 marks]**

If a PC is unable to shut down, then explore the possible solutions for it and write them.

Submissions:

- For In-Lab Activity: TA's will evaluate them in the laboratory.
- For Post-Lab Activity: TA's will collect the task written on the paper by students.

Evaluations Metric:

- In-Lab task 1 will be evaluated in the lab by TA's
- All other tasks will be evaluated offline
- Division of In-Lab tasks:
 - Quiz [10 marks]
 - Change Cursor Speed [15 marks]
 - Analyzing Ergonomics
 - Create text file [05 marks]
 - Ergonomics improvement [20 marks]
- Division of Post-Lab tasks:
 - Possible symptoms [10 marks]
 - Possible solutions [20 marks]

References and Additional Material:

- Beep Patterns
<https://www.computerhope.com/beep.htm>
- Fixing My Computer
<http://www.fixingmycomputer.com/index.html>
- Ways to Maintain Good Posture While Working on The Computer
<https://www.postureg.com/maintain-good-posture-working-computer/>
- How to Optimize Your Work Efficiency and Concentration
<https://www.standardpro.com/optimize-your-work-efficiency/>

Lab Time Activity Simulation Log:

- Slot – 01 – 00:00 – 00:15: Class Settlement
- Slot – 02 – 00:15 – 00:30: Troubleshooting
- Slot – 03 – 00:30 – 00:45: Troubleshooting
- Slot – 04 – 00:45 – 01:00: Troubleshooting
- Slot – 05 – 01:00 – 01:15: Task Manager
- Slot – 06 – 01:15 – 01:30: Task Manager
- Slot – 07 – 01:30 – 01:45: Computer Ergonomics
- Slot – 08 – 01:45 – 02:00: Computer Ergonomics
- Slot – 09 – 02:00 – 02:15: Quiz
- Slot – 10 – 02:15 – 02:30: In-Lab Task
- Slot – 11 – 02:30 – 02:45: In-Lab Task
- Slot – 12 – 02:45 – 03:00: In-Lab Task