**SVKM’s NMIMS University**

**Mukesh Patel School of Technology Management & Engineering**

**Computer Engineering Department**

**Course Policy**

| **Program/Branch/Semester** |  | **BTI / All streams/ Sem III** | |
| --- | --- | --- | --- |
| **Academic Year** |  | **2023 - 24** | |
| **Course Code & Name** | **:** | **Computer Hardware and Maintenance** | |
| **Credit Details** | **:** | Lectures - 0, Tutorial - 0, Practicals - 2  Credit - 1 | |
| **Course Coordinator** | **:** | **Dr Seema Shah** | |
| **Contact No. & Email** | **:** | Extn: 0511  Email: seema.shah@nmims.edu | |
| **Office** | **:** | Admin Area, Ground Floor –SBMP Building | |
| **Contact hours** |  | Lunch Break (01.00 pm to 02.00 pm) | |
| **Course Faculties** | | | |
| **Course Faculty 1** | | **Course Faculty 2** | |
| **Course Faculty 3** | |  | |

| **Queries by Emails are encouraged** | | | |
| --- | --- | --- | --- |
| **Course Site/ Student Portal Link** | **:** | Portal Link | |

**1. Introduction to the Course**

1.1 Importance of the course:

Computer hardware comprises all the visible components, such as graphics card, CPU, motherboard, etc. Without these components, running the software that smoothens the functioning of the system is impossible.

This course will develop students in the following areas:

* Creativity: To be able to come up with new technologies.
* Analytical skills: To study complex systems and additionally find ways for further improvement.
* Problem-solving: To find the issues in the system; most importantly, to come up with the right solution.
* Critical-thinking: Use reason and logic to set goals; in addition to this, investigate the possibility of the assumptions made, and find the strengths and weaknesses of the proposed alternative solutions.
* Communication skills: A computer hardware engineer needs to be good at communication to work with different teams comfortably.

1.2 Objective of the Course

To impart knowledge of computer hardware and its testing & troubleshooting.

1.3 Prerequisite:

Electrical and Computer workshop

**2. Course Learning Outcomes (CO) and mapping with Program Outcomes (PO)**

## 2.1 Course Outcomes and Program Outcomes

Course Outcomes

After completion of the course, students would be able to

1. Identify the hardware components of the computer system
2. Illustrate troubleshooting process for common computer problems
3. Identify power supply units and networking peripherals

## 2.2 CO-PO Mapping

|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CO1 |  | 2 |  |  | 2 |  |  |  | 2 | 2 |  | 2 |
| CO2 |  |  |  |  | 2 |  |  | 2 | 2 | 2 |  |  |
| CO3 |  | 2 |  |  | 2 |  |  |  | 2 | 2 |  | 2 |

**3. Syllabus, Pre-class activity and References**

3.1 Teaching And Evaluation Scheme:

| **Teaching Scheme** | | | | | | **Evaluation Scheme** | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Lecture  Hours per week | | Practical  Hours per week | | Tutorial  Hours per week | Credit | Internal Continuous Assessment (ICA)  As per Institute Norms | Term End Examinations (TEE) (Marks - 100 in Question Paper) | | | |
| 0 | | 2 | | 0 | 1 | Scaled to 50 marks | NA | | | |

3.2 Syllabus:

| **Unit** | **Description** | | | | | | | **Duration** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | **PC Hardware and Components**  Introduction to computer hardware, components of motherboards, CPU, various ports, slots, connectors, addon cards Primary and secondary memory and their installation, Cabinet types | | | | | | | **06** |
| **2** | **Diagnose & repair problems of Desktop and Laptop**  General Troubleshooting rules, Preventive Maintenance. BIOS Features, BIOS & Boot Sequences, BIOS Shortcoming & Compatible Issues, BIOS Troubleshooting. POST, Error Code: Beep Code, Post Code, preventive maintenance of latest gadgets | | | | | | | **06** |
| **3** | **Input-Output devices and their troubleshooting**  Troubleshoot Input-Output devices: keyboard, switches, mouse, scanners, webcam, monitors, printers, speaker and mike, LCD projector.  I/O Cables: specification of I/O Cables, types of I/O cables, types of I/O ports, internal and external modem | | | | | | | **06** |
| **4** | **Power Supply**  Switched Mode Power supply block diagram, working principles, testing and troubleshooting, power rating, requirement of SMPS wattage depending parameters like type of processors and HDDs | | | | | | | **06** |
| **5** | **Transmission Media and Networking Connectivity Hardware**  Network interface cards–Ethernet, Cabling Concepts (designing, installing, and maintaining modern communications infrastructures and electronic physical security systems. Fiber optics, wireless networks), various networking devices like routers, repeaters, switches, bridges | | | | | | | **06** |
| **Total** | | | | | | | | **30** |

**3.3 Pre-lab activity**

Reading Manual will be provided prior to commencement of the course. It contains details of all the topics mentioned in the syllabus as well as provides video links which will help a student to understand the concept in detail.

It will be available on the student portal. Students are expected to go through this material before attending the upcoming session. It is expected that the students put in at least two hours of self-study for every one hour of classroom teaching.

During the lab session, the focus will be given on demo, simulation, and Handson practice.

C1 :

Padlet activity 1: <https://padlet.com/4seema/chm-padlet-activity-1-dvihe1vm9jn3jcgi>

**3.4 References**

| **Text Books:**   1. Craig Zacker, *PC Hardware: The Complete Reference*, 1st edition, McGraw-Hills, 2019 2. Reference material from Internet | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Reference Books:**   1. James, K.L. *The computer hardware installation, interfacing troubleshooting and maintenance,* PHI Learning, New Delhi, 2014 | | | | | | | | | | |

Note: The latest edition of books should be referred to.

**4. Laboratory details**

Laboratory exercises should be completed as per the given schedule. It is expected that a student does the same with a full understanding of the concept, procedure and application involved.

Laboratory work will be based on the above syllabus with the following 10 exercises to be performed.

| **Sr.No / Week No** | **Aim of the experiment** | **Unit No / Mapped CO** |
| --- | --- | --- |
| 1 | To get familiar with Computer System specifications (Demo and Market Survey)  **Reading:** Reading manual - Chapter 1  **Task 1:**  Fill in the details in the following table after the demo:  **Table 1: Specification of Desktop PC**   | **Sr. No.** | **Part** | | | **Manufacturer** | **Specification** | | --- | --- | --- | --- | --- | --- | | 1 | Processor (CPU) | | |  |  | | 2 | Operating System | | |  |  | | 3 | Memory | | |  |  | | 4 | Storage (Hard Disk) | | |  |  | | 5 | Graphics Card | | |  |  | | 6 | Display/Monitor | | |  |  | | 7 | Hard Disk Drive | | |  |  | | 8 | CD/DVD Drive | | |  |  | | 9 | Keyboard | | |  |  | | 10 | Mouse | | |  |  | | 11 | Network Adaptor | | |  |  | | 12 | HDMI / VGA Port | | |  |  | | 13 | USB Ports | | |  |  | | 14 | Card Reader | | |  |  | |  |  | | |  |  |     **Table 2: Specification of Laptop**   | **Part** | **Manufacturer** | **Specification** | | --- | --- | --- | | Processor (CPU) |  |  | | Operating System |  |  | | Memory |  |  | | Storage |  |  | | Graphics Card |  |  | | Display (LED/LCD) |  |  | | Hard Disk Drive |  |  | | CD/DVD Drive |  |  | | Network Adapter |  |  | | HDMI Port |  |  | | USB Port |  |  | | Wireless Network |  |  | | Camera |  |  | |  |  |  |   **Task 2:**  Label different parts of the Desktop Computer shown in Fig. 1    Label different parts of the Laptop shown in Fig. 2 in a slide.    **Task 3: (Practicum Segment)**   * Students need to go to the images below and select a mandatory component for Practicum. * Every student needs to pick up a unique component | 1/CO1 |
| 2 | To assemble and Disassemble the Desktop PC and identify its parts (Demo)  **Video Link:** [How To Build A PC - Step by Step (Full Build Guide)](https://youtu.be/PXaLc9AYIcg)  Jot down important points you have learnt from the video.  **Task 1:**   1. Demo will be given to the students about the steps to assemble a PC 2. Students will assemble a PC in a group of 5 after the demo   **Task 2:**  Students will be taken for a server room tour / shown a video of the server room. The following table needs to be filled up after the tour:   | **Sr. No.** | **Part** | **Manufacturer** | **Specification** | | --- | --- | --- | --- | | 1 | Server Type |  |  | | 2 | Processor (CPU) |  |  | | 3 |  |  |  | | 4 | Nos. of Processors |  |  | | 5 | Memory-RAM |  |  | | 6 | Cache Memory (L1  and L2) |  |  | | 7 | Hard Disk Drive |  |  | | 8 | Hard Drives Supported  (IDE/SCSI) |  |  | | 9 | Network Adapter |  |  | | 10 | Firewire Port |  |  | | 11 | USB Port |  |  | | 12 | Wireless |  |  | | 13 | Operating System |  |  | | 14 | CD/DVD Drive |  |  |   **Task 3**:  Prepare a detailed technical report of the visit to the server room. | 1/CO1 |
| 3 | To configure BIOS setup program and troubleshoot the problems using BIOS utility (Handson)  **Reading:** Reading Manual Page 26 - 49  **Task 1:**  Follow the following steps to enter the BIOS Setup Program utility:   1. Power ON the computer. 2. After power On, a black screen appears on your monitor, wait until the message appears briefly at the bottom of the screen such as "Press F2 to enter SETUP, F12 for Network Boot, ESC for Boot Menu" 3. Now press the F2 key to enter the setup program. (This key may vary from one machine to another machine depending on the manufacturer of the BIOS Setup program) 4. Observe different BIOS setups.   **Task 2:**   1. List cache type, size and memory size of the system from Main setup. 2. State any two setting under CPU configuration. 3. Write down boot devices priority in boot sequence menu as follows:   1st Boot Device:  2nd  Boot Device:  3rd Boot Device:  **Task 3:**  Student generated Question activity   1. Generate a question based on the BIOs activity 2. Answer a question of another student and share your question with him./her | 2/CO2 |
| 4 | To troubleshoot the Harddisk (Handson)  **Video Link:** [How to Troubleshoot Your Hard Drive](https://www.youtube.com/watch?v=yyEZotOPQJc)  **Task 1:**  **Follow the steps for Troubleshooting Harddisk**  1. **Corrupted files on hard disk:** Avoid installing suspected software and malicious programs into your hard disk. Clean the hard disk on a regular basis to remove unwanted programs. Use Disk Clean up utility in windows.  **To open Disk Clean up on a Windows follow these instructions:**  a. Click Settings > Click Control Panel > Administrative Tools.  b. Click Disk Clean up.  c. At the Drives list, select which drive you want to run Disk Clean up on.  d. Select which files you want to delete.  e. Click OK.  f. Click delete files.  2. **Virus threat:** Students should practice scanning and malware detection with available antivirus S/W. Update the anti-virus program  3. **Slow performance of Hard disk:**  Steps to be followed for Defragmentation with Windows:  a. Open the Computer window.  b. Right-click the media you want to defragment, such as the main hard drive, C.  c. In the drive's Properties dialog box, click the Tools tab.  d. Click the Defragment Now button.  e. The Disk Defragmenter window appears. Click the Analyse Disk button. Wait while Windows checks the defragmentation on the media.  f. Check the Percent Fragmented value by the disk in the Disk Defragmenter window. If it's zero, there's no point in continuing: Skip to Step 8.  g. Even when the drive shows O percent fragmented files, you can still proceed with defragmentation. No media can be fully defragmented, so the Windows Defragmenter will always find something to do.  h. Click the Defragment Disk button.  1. Windows defragments the media. You shouldn't do anything on your computer while the media is being defragmented.  J. Click the Close button, and close up any other windows you opened.  4. **Computer fails to detect hard disk:** Check through BIOS. If still undetected, check the power supply and connections. Practice switching the drive to another power plug. | 2/CO1,CO2 |
| 5 | To study the maintenance of Computer processors(Demo, Handson)  **Reading: Reading Manual Chapter 2**  **Task 1:**  A demo will be given to students about the application of thermal paste and how it works. Students need to observe it carefully and note down the important points  **Task 2:**  Students will be assigned a task to take out the heat sync and apply thermal paste to the processor in a group of 5 | 2/CO1, CO2 |
| 6 | To install and troubleshoot printer (Handson)  **Task 1:**  **Steps to install printer:**  1. Plug the power supply cable to printer properly.  2. Plug the Data cable to printer and PC port such as USB or parallel.  3. Press the Power button to tum ON printer and the power light comes on.  4. Put some papers in the paper tray/drawer.  **Way 1: Installing a plug and play printer**  a. If printer is plug and play device, connect it and power it on; Windows Operating System installs device driver automatically if printer device driver is in-built in Windows Operating System.  b. If printer device driver is not in-built in Windows Operating System then insert the disk that came with the printer and follow the on-screen instructions.  c. Test the printer to make sure it is working.  **Way 2: Installing a printer using the CD**  a. Second way of installation is to insert the CD that came with the printer.  b. If the CD does not automatically start, open "My Computer", double-click on the CD drive, and then click the Setup or Install file.  c. Follow the installation wizard and once completed your software is installed.  d. Test the printer to make sure it is working.  **Way 3: Installing a printer only using the drivers**  (If you only want the printer to be installed without extra software application programs, you can only install the printer driver by following the steps below.)  a. With the printer connected and ON, open the "Control Panel".  b. In the Control Panel double-click the Printers or Printers and Fax icon .  c. In the Printers window, click the Add a printer icon.  d. After completing the above steps, you should see the Windows Printer Wizard. Click Next to start the wizard.  e. Next, you have the choice of installing a Local or Network printer. If the printer is connected to computer choose Local printer attached to this computer and click Next.  f. When prompted for the location of the printer drivers, browse to the directory of printer drivers or point it to the printer CD  **Task 2:**  After the printer is installed, you can use Windows to print a self-test page to verify the printer is working.  1. Click "Start", Settings, and open "Control Panel".  2. Double-click the "Printers or Printers and Fax icon".  3. Right-click on the Printer you want to test and click "Properties". If you do not see your printer, your printer is not installed .  4. In the "Printers Properties" window, click the "Print Test Page" button.  5. If the printer can print a test page, your printer is installed and setup properly.  Sharing the printer:  After the printer is installed, you can share a printer in network if your PC is connected in the network.  1. Click "Start", Settings, and open "Control Panel".  2. Double-click the "Printers or Printers and Fax icon".  3. Right-click on the Printer you want to share and click "Sharing". If you do not see your printer, your printer is not installed.  4. In the "Sharing" window, Check the box that says "Share this printer"-=-  5. Then, you can edit the share name of the printe r, in case you don't want to use the default  name provided by Windows.  6. When done, click OK.  7. The printer is now shared with the other computers on your network, regardless of the operating systems they are using  **Task 3:**  1. If you do not have any indicator light, make sure the printer is connected to a working power outlet by verifying each end of the power cable.  2. If the indicator is blinking or is orange, often this is an indication of a printer error, like a paper jam or an issue with the ink or toner cartridge. Remove the panel and carefully pull out the jammed paper.  3. No paper or paper jam -without paper, your printer will not be able to print. Make sure you have paper loaded into the printer paper cartridge or tray. | 3/CO1,CO2 |
| 7 | To install and configure Scanner, Webcam and bio-metric devices with the system and troubleshoot the problems (Demo)  **Task 1:**   1. Plug your web camera or scanner into your computer. 2. If your camera is Plug and Play, the Scanner and Camera Wizard starts 3. Double-click Add Device. 4. Follow the instructions on your screen. | 3/ CO1, CO2 |
| 8 | To observe various cables and connectors used in networking (Demo)  **Task 1:**  Students will be given a demo about the following components:   * RJ-45 connector * IO Connector * Crimping Tool * Twisted-pair Cable * Cable Tester   **Task 2:**   1. Remove the outmost vinyl shield for 12mm at one end of the cable (we call this side A-side). 2. Arrange the metal wires in parallel 3. Insert the metal wires into RJ45 connector on keeping the metal wire arrangement 4. Set the RJ45 connector (with the cable) on the pliers, and squeeze it tightly. 5. Make the other side of the cable ( B-side) in the same way.   **Task 3:**  Testing the crimped cable using a cable tester:   * Step 1 : Skin off the cable jacket 3.0 cm long cable stripper up to cable * Step 2: Untwist each pair and straighten each wire 190 0 1.5 cm long. * Step 3 : Cut all the wires * Step 4 : Insert the wires into the RJ45 connector right white orange left brown the pins facing up * Step 5 : Place the connector into a crimping tool, and squeeze hard so that the handle reaches its full swing. * Step 6: Use a cable tester to test for proper continuity | 3/CO1, CO3 |
| 9 | To install SMPS and measure voltage levels in connectors of SMPS (Demo)  **Reading:** Reading Manual Chapter 4  **Task 1:**   1. Connect main AC supply to SMPS and switch ON. 2. Check voltage levels in all connectors of SMPS using digital multi-meter 3. Note all voltage levels in Observation table given below. 4. If voltage levels of all connector are correct, then switch OFF the power supply   **Task 2:**  Write down the different voltage levels observed in Table given below:   | **Pin No** | **Wire Color** | **Output Voltage** | | --- | --- | --- | | | 1 | Orange |  | | 2 | Orange |  | | 3 | Black |  | | 4 | Red |  | | 5 | Black |  | | 6 | Red |  | | 7 | Black |  | | 8 | Gray |  | | 9 | Purple |  | | 10 | Yellow |  | | 11 | Yellow |  | | 12 | Orange |  | | 13 | Orange |  | | 14 | Blue |  | | 15 | Black |  | | 16 | Green |  | | 17 | Black |  | | 18 | Black |  | | 19 | Black |  | | 20 | White |  | | 21 | Red |  | | 22 | Red |  | | 23 | Red |  | | 24 | Black |  |   **Task 3:**   1. Write wattage of given SMPS. 2. State how many power outlets (Connectors) on SMP | 4/ CO3 |
| 10 | Study of various networking devices  **Task:**  Demonstration of various networking devices  **Activity**:  Prepare a detailed report of the following networking devices which can be used to set up a LAN network.  Devices: Hub, access point, switches, routers, bridge, repeater, firewall, fiber connectivity and modems.  The report can be based on types, manufacturers, costing, basic working principle, installation and maintenance instructions. | 5/ CO3 |
| 12-14 | **Practicum (Mini Project)**  -   * Data Center Infrastructure Case Study * Cloud Center Infrastructure Case study * IT set up for your school (if not possible then for college of company where family member is working), Visit the school if needed | CO1, CO2, CO3 |

**5. Tutorials details -**

No Tutorials for Course

**6. Assessment Policy**

**6.1 Component-wise Continuous Evaluation (CE), Laboratory and Project Work (LPW) & Term End Examination (TEE) weightage**

| **Assessment Component** | **ICA (100 Marks)**  **(Marks scaled to 50)** | | | | | | **TEE (100 marks)**  **(Marks scaled to 50)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Regular Lab Performance (A)** | **Lab Viva**    **(B)** | **Challenging learning assessment tools**  **(Practicum) (C)** | **Class interaction and other learning**  **(D)** | | **Class Test 1 1 and 2**  **(E)- Open book** |
| **Weightage** | 30% | 10% | 10% | 10% | | 40% | 50% |
| **Marks** | 30 | 10 | 10 | 10 | | 20+20 | NA |
| **Date/week of activity** | Weekly | Week 10 & 11 | Week 14 | Week 2 and Week 13 | | **M1:**  August 16-23  **M2:**  October10-15 | NA |

**6.2 Assessment Policy for Internal Continuous Assessment (ICA)**

Assessment of Continuous Evaluation comprises three components.

Assessment of ICA comprises the following components.

1. **Regular Lab Performance (A)** 
   1. Continuous assessment for laboratory experiments will be conducted. There are 11 practicals, each carrying a weightage of 10 marks. At the end of the course, an average of total marks will be taken to obtain marks out of 20.
   2. Discussion of your work with your peers is allowed. However, each student is expected to submit his/her original work. Submissions which are very similar will be marked zero. Assessment of the lab work will be carried out based on parameters like timely completion of lab work file, understanding of the experiment performed, originality in the work, involvement of the student, regularity, discipline etc. during the session. There is a 30% penalty for a late submission.
2. **Lab Exam and Viva (B)**

Lab test will be conducted based on the concepts learnt. Viva will be based on the lab test topic

1. **Challenging learning assessment tools (Practicum) (C)**

Data Center Infrastructure Case Study

1. **Class interaction and other learning (D):**

The class activity includes Active learning techniques mentioned in the course policy to assess the involvement and understanding of the student in the classroom. It also includes the participation of students in national/international competitions, coding competitions, SRG projects, publications, startup initiatives, and any other activity which adds to the learning of the student may also be considered in lieu of class interaction.

1. **Class Tests (E): (20 Marks each)**

Two class tests will be conducted as per the academic calendar.

**M1:** August 16-23, 2022

Market Survey on assigned topic

**M2:** October10-15, 2022

Configuration of a Personal Computer using a mandatory component (Harddisk / SSD / Processor / Motherboard / RAM) - Market Survey, Handson, Report

1. Practicum is an individual activity
2. After choosing the mandatory component student needs to build 2 Personal Computers using component (Simulation)
   1. Budget PC
   2. High-End PC
3. The following link can be used for simulation:

<https://assembleyourpc.net/rig>

1. The student needs to ensure compatibility of all the other components with the selected component
2. A report is expected as the output of practicum
3. The report must contain the following points:

* Coverpage (Title, name and SAP ID)
* Details and pictures of the mandatory component
* PC Build 1 and 2 screenshots from assembleyourpc.com with details about the compatibility of all components
* References

1. Students will be graded on the basis of peer review of compatibility

## 6.3 Assessment Policy for Term End Examination (TEE)

Nil

7. **Lesson Plan**

No Theory Lecture for Course

**9. Teaching-learning methodology**

1. **Laboratory:**
   * Outline for the preliminary study to be done for each unit will be provided prior to the commencement of each unit.
   * Deeper concepts and applications will be explained through presentations and Video Lectures.
   * Lab manual consisting of theory to support the lab experiment will be available in the shared folder.
   * Explanation of the lab exercise to be performed along with co-relation with theory will be given. At the end of each Lab and Mini Project assessment will be carried out. Students will be quizzed to check their understanding of the exercise conducted.
   * Regular lab assessment and grading will be done. Students will be marked based on parameters like learning, completion of lab assignments, originality, interaction during the lab, and punctuality

**10. Active learning techniques (May be tuned as per course)**

Active learning is a method of learning in which students are actively or experientially involved in the learning process. In active learning, teachers are facilitators rather than one-way providers of information. The presentation of facts, so often introduced through straight lectures, is deemphasized in favour of class discussion, problem-solving, cooperative learning, and writing exercises (graded and ungraded). Following active learning techniques will be adopted for the course.

1. **Muddiest topic:**

This technique is aimed at finding out the least understood point/topic in the session. This is then further explained to ensure that it is understood well.

1. **Think Pair Share:**

Students ponder the answer to a question and then share their thoughts with a neighbour.

1. **﻿Role Playing:**

Students look at the topic from the perspective of a character, who will affect and be affected by a chosen topic.

1. **Quick write:**

A prompt is posed for students to respond to in writing. Taking only 5 minutes or so, this is a quick way to accomplish one or more of the following: determine whether or not students have done the homework assignment, engage students in thinking about the topic that will be covered in the session, and provide the opportunity for students to access their prior knowledge on a topic. The quick write can be graded to encourage students to do their reading assignment, or collected to serve as an attendance check.

1. **Peer Review:**

Students review and comment on materials written by their classmates

1. **Discussion:**

Promoting a successful discussion depends on correctly framing questions. Discover tips for framing discussion questions to promote higher-order thinking.

1. **Case study-based discussion:**

Student groups can discuss case studies to apply course content to solve real-world problems.

1. **Structured Sharing**

It is a technique that helps students review the content of the class/presentation from different points of view, and at the same time helps you assess whether the students are learning the intended information and discover what questions they may still have. A Structured Sharing activity takes about 15-20 minutes. You can easily expand or contracts the activity to fill the available time. Before class, identify a superlative you would like to focus on. During the activity, the students will respond with their ideas about the superlative you choose. Ideas for superlatives include:

* What are the most important points from the day’s lesson and/or readings?
* What are the most useful ideas?
* Which are the most relevant to our times?

Here are a few more ideas for superlatives:

* Most confusing
* Most amusing
* Most controversial
* Most unusual
* Most difficult
* Most credible
* Most surprising
* Most trivial

Write your own answers for the superlatives.

1. **Frame a question: Students** will be asked to design and frame their own questions pertaining to the topic being taught. The idea is to stimulate students’ curiosity, engage the students in collaborative teaching and learning, and motivate students to develop a deeper understanding of the topic.
   * Frame questions for each unit of the course: At the beginning of each lesson, the faculty will create a new page in *OneNote Class Notebook* in the collaborative section where every student will post his/her question.
   * Frame a question in the lab: As discussed in section 6.2, students will be asked to design one unique lab problem based on the course syllabus.
2. **Brainstorming: S**tudents will be asked to generate ideas on a certain topic, category or question while the faculty will facilitate and record the answers on the blackboard/whiteboard.
3. **Blended Learning:** Students will be introduced to the topic at home while the in-depth topics, applications and numerical problems will be discussed by the faculty in the lecture session. Outline for a preliminary study to be done for each unit will be provided prior to commencement of each unit. Preliminary study material (video links, presentation, notes, etc.) will be available on the student portal.

**11. Course Material**

Following course material is uploaded on the student portal:

* Course Policy
* Lecture Notes
* Books / Reference Books / NPTEL video lectures
* Assignments,
* [Web-links](https://sites.google.com/a/nirmauni.ac.in/3ec1218-testing-and-verification-of-vlsi-design/home/academic-docs/m-course-related-important-web-links), Blogs, [Video Lectures](https://sites.google.com/a/nirmauni.ac.in/3ec1218-testing-and-verification-of-vlsi-design/home/academic-docs/o-video-lectures-if-available-like-nptel-mooc-etc), Journals
* Animations /Simulations, Software
* Advanced topics

**12. Course Learning Outcome Attainment**

Following means will be used to assess the attainment of course learning outcomes.

* Use of formal evaluation components of continuous evaluation, practicum, and laboratory work
* Informal feedback during course conduction

**13. Academic Integrity Statement**

Students are expected to carry out assigned work under the Continuous Evaluation (CE) component and LPW component independently. Copying in any form is not acceptable and will invite strict disciplinary action. Evaluation of corresponding components will be affected proportionately in such cases. Plagiarism detection software will be used to check plagiarism wherever applicable. Academic integrity is expected from students in all components of course assessment.