**DAILY ASSESSMENT FORMAT**

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| **Date:** | **12-June-2020** | **Name:** | **Raziya Banu** |
| **Course:** | **VLSI** | **USN:** | **4AL16EC058** |
| **Topic:** | **MOS transistor basics-II and III** | **Semester & Section:** | **8th sem & ‘B’ section** |
| **Github Repository:** |  |  |  |

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| **FORENOON SESSION DETAILS** |
| **Image of session** |
| **Report –**  In my first session today I have studied about the MOSFET - MOS transistor basics-II and III.  The most common type of insulated gate FET which is used in many different types of electronic circuits is called the **Metal Oxide Semiconductor Field Effect Transistor** or **MOSFET** for short.  The **IGFET** or **MOSFET** is a voltage controlled field effect transistor that differs from a JFET in that it has a “Metal Oxide” Gate electrode which is electrically insulated from the main semiconductor n-channel or p-channel by a very thin layer of insulating material usually silicon dioxide, commonly known as glass.  This ultra thin insulated metal gate electrode can be thought of as one plate of a capacitor. The isolation of the controlling Gate makes the input resistance of the **MOSFET** extremely high way up in the Mega-ohms ( MΩ ) region thereby making it almost infinite.  As the Gate terminal is electrically isolated from the main current carrying channel between the drain and source, “NO current flows into the gate” and just like the JFET, the MOSFET also acts like a voltage controlled resistor where the current flowing through the main channel between the Drain and Source is proportional to the input voltage. Also like the JFET, the MOSFETs very high input resistance can easily accumulate large amounts of static charge resulting in the **MOSFET** becoming easily damaged unless carefully handled or protected.  Like the previous JFET tutorial, MOSFETs are three terminal devices with a Gate, Drain and Source and both P-channel (PMOS) and N-channel (NMOS) MOSFETs are available. The main difference this time is that MOSFETs are available in two basic forms:   * Depletion Type   –   the transistor requires the Gate-Source voltage, ( VGS ) to switch the device “OFF”. The depletion mode MOSFET is equivalent to a “Normally Closed” switch. * Enhancement Type   –   the transistor requires a Gate-Source voltage, ( VGS ) to switch the device “ON”. The enhancement mode MOSFET is equivalent to a “Normally Open” switch.   The symbols and basic construction for both configurations of MOSFETs are shown below.  mosfet symbol  The four MOSFET symbols above show an additional terminal called the Substrate and is not normally used as either an input or an output connection but instead it is used for grounding the substrate. It connects to the main semiconductive channel through a diode junction to the body or metal tab of the MOSFET.  Usually in discrete type MOSFETs, this substrate lead is connected internally to the source terminal. When this is the case, as in enhancement types it is omitted from the symbol for clarification.  The line in the MOSFET symbol between the drain (D) and source (S) connections represents the transistors semiconductive channel. If this channel line is a solid unbroken line then it represents a “Depletion” (normally-ON) type MOSFET as drain current can flow with zero gate biasing potential.  If the channel line is shown as a dotted or broken line, then it represents an “Enhancement” (normally-OFF) type MOSFET as zero drain current flows with zero gate potential. The direction of the arrow pointing to this channel line indicates whether the conductive channel is a P-type or an N-type semiconductor device.  **Basic MOSFET Structure and Symbol**  mosfet construction  The construction of the Metal Oxide Semiconductor FET is very different to that of the Junction FET. Both the Depletion and Enhancement type MOSFETs use an electrical field produced by a gate voltage to alter the flow of charge carriers, electrons for n-channel or holes for P-channel, through the semiconductive drain-source channel. The gate electrode is placed on top of a very thin insulating layer and there are a pair of small n-type regions just under the drain and source electrodes.  We saw in the previous tutorial, that the gate of a junction field effect transistor, JFET must be biased in such a way as to reverse-bias the pn-junction. With a insulated gate MOSFET device no such limitations apply so it is possible to bias the gate of a MOSFET in either polarity, positive (+ve) or negative (-ve).  This makes the MOSFET device especially valuable as electronic switches or to make logic gates because with no bias they are normally non-conducting and this high gate input resistance means that very little or no control current is needed as MOSFETs are voltage controlled devices. Both the p-channel and the n-channel MOSFETs are available in two basic forms, the **Enhancement** type and the **Depletion** type.  **Depletion-mode MOSFET**  The **Depletion-mode MOSFET**, which is less common than the enhancement mode types is normally switched “ON” (conducting) without the application of a gate bias voltage. That is the channel conducts when VGS = 0 making it a “normally-closed” device. The circuit symbol shown above for a depletion MOS transistor uses a solid channel line to signify a normally closed conductive channel.  For the n-channel depletion MOS transistor, a negative gate-source voltage, -VGS will deplete (hence its name) the conductive channel of its free electrons switching the transistor “OFF”. Likewise for a p-channel depletion MOS transistor a positive gate-source voltage, +VGS will deplete the channel of its free holes turning it “OFF”.  In other words, for an n-channel depletion mode MOSFET: +VGS means more electrons and more current. While a -VGS means less electrons and less current. The opposite is also true for the p-channel types. Then the depletion mode MOSFET is equivalent to a “normally-closed” switch.  **Depletion-mode N-Channel MOSFET and circuit Symbols**  depletion mode mosfet symbols  The depletion-mode MOSFET is constructed in a similar way to their JFET transistor counterparts were the drain-source channel is inherently conductive with the electrons and holes already present within the n-type or p-type channel. This doping of the channel produces a conducting path of low resistance between the Drain and Source with zero Gate bias.  **Enhancement-mode MOSFET**  The more common **Enhancement-mode MOSFET** or eMOSFET, is the reverse of the depletion-mode type. Here the conducting channel is lightly doped or even undoped making it non-conductive. This results in the device being normally “OFF” (non-conducting) when the gate bias voltage, VGS is equal to zero. The circuit symbol shown above for an enhancement MOS transistor uses a broken channel line to signify a normally open non-conducting channel.  For the n-channel enhancement MOS transistor a drain current will only flow when a gate voltage ( VGS ) is applied to the gate terminal greater than the threshold voltage ( VTH ) level in which conductance takes place making it a transconductance device.  The application of a positive (+ve) gate voltage to a n-type eMOSFET attracts more electrons towards the oxide layer around the gate thereby increasing or enhancing (hence its name) the thickness of the channel allowing more current to flow. This is why this kind of transistor is called an enhancement mode device as the application of a gate voltage enhances the channel.  Increasing this positive gate voltage will cause the channel resistance to decrease further causing an increase in the drain current, ID through the channel. In other words, for an n-channel enhancement mode MOSFET: +VGS turns the transistor “ON”, while a zero or -VGS turns the transistor “OFF”. Thus the enhancement-mode MOSFET is equivalent to a “normally-open” switch.  The reverse is true for the p-channel enhancement MOS transistor. When VGS = 0 the device is “OFF” and the channel is open. The application of a negative (-ve) gate voltage to the p-type eMOSFET enhances the channels conductivity turning it “ON”. Then for an p-channel enhancement mode MOSFET: +VGS turns the transistor “OFF”, while -VGS turns the transistor “ON”. |

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| **Course:** | **Udemy** | **USN:** | **4AL16EC058** | |
| **Topic:** | **Programming core Java** | **Semester & Section:** | **8th sem & ‘B’ section** | |
| **AFTERNOON SESSION DETAILS** | | | |
| **Image of session** | | | |
| **Getting User Input** How to get console user input in your Java programs using the JDK Scanner class.  import java.util.Scanner**;**  **public** **class** **App** **{**  **public** **static** **void** **main(**String**[]** args**)** **{**    *// Create scanner object*  Scanner input **=** **new** Scanner**(**System**.**in**);**    *// Output the prompt*  System**.**out**.**println**(**"Enter a floating point value: "**);**    *// Wait for the user to enter something.*  **double** value **=** input**.**nextDouble**();**    *// Tell them what they entered.*  System**.**out**.**println**(**"You entered: " **+** value**);**  **}**  **}**    **Note**: if you're in Europe outside the UK, you might need to enter floating point numbers in the format x,y rather than x.y as is normal in the USA and UK.  Enter a floating point value:  5,6  You entered: 5.6 **Switch**[**Java for Complete Beginners**](https://www.caveofprogramming.com/categories/java-video/index.html) How to use the switch statement in Java; a construct that many programmers neglect but that invariably appears early on in tests and courses!  When the video is running, click the maximize button in the lower-right-hand corner to make it full screen.  **import java.util.Scanner;**  **public class Application {**  **public static void main(String[] args) {**  **Scanner input = new Scanner(System.in);**  **System.out.println("Please enter a command: ");**  **String text = input.nextLine();**  **switch (text) {**  **case "start":**  **System.out.println("Machine started!");**  **break;**  **case "stop":**  **System.out.println("Machine stopped.");**  **break;**  **default:**  **System.out.println("Command not recognized");**  **}**      **}**  **}** | | | |