Lab 7
JFET Amplifiers

Purpose
This experiment will investigate the characteristics of the common-source and common-drain amplifier.

Material and Equipment
NI ELVIS
NTE 312 N Channel JFET.
Resistors: 2 k (2), 3.9k, 10 k (2), 100 k, 200 k, 1 M.
Capacitors: 100 µF, 47µF, 1µF.

Theory
In this lab, two JFET amplifier configurations will be investigated; the common-source, and the common-drain amplifier.

The basic common-source(CS) circuit is shown in Figure 7-1. In comparison to the BJT common-emitter amplifier, the FET amplifier has a much higher input impedance, but a lower voltage gain.

The voltage gain of the circuit can be expressed as

\[ A_v = -g_m R_D \]

Figure 7-1: Common-Source Amplifier
Figure 7-2: The Junction Field Effect Transistor (NTE 312)

Figure 7-2 shows the transistor terminals for your reference.

The common-drain (CD) amplifier is shown in figure 7-3. The common-drain configuration is often called a source follower as the voltage gain is nearly unity. The common drain FET amplifier is similar to the common collector configuration of the bipolar junction transistor.

![Common-Drain Amplifier Diagram]

**Procedure**

1) Common-Source Amplifier  
   a) Connect the circuit as shown in Figure 7-1.  
   b) Use $C_{c1} = 1\mu F$, $C_{c2} = 47\mu F$, $C_s = 100\mu F$, $R_L = 3.9\ k\Omega$, $R_S = R_D = 2\ k\Omega$, $R_1 = 200\ k\Omega$, $R_2 = 100\ k\Omega$, $V_{DD} = 12\ V$.  
   c) Apply a sinusoidal signal with frequency 1kHz, amplitude 1Vp-p, supply voltages at 10V.  
   d) Observe the output.  
   e) Capture both input and output waveforms.  
   f) Calculate the voltage gain.  
   g) Measure the operating point.
2) Common-Drain Amplifier
   a) Connect the circuit as shown in Figure 7-3.
   b) Use \( R_G = 1 \text{M } \Omega \), \( R_S = R_L = 10 \text{k } \Omega \), supply \( V_{DD} = 10 \text{ V} \) and \( V_{SS} = -10 \text{ V} \).
   c) Apply a sinusoidal signal with frequency 1kHz, amplitude 2Vp-p.
   d) Observe the output.
   e) Capture both input and output waveforms.
   f) Calculate the voltage gain.
   g) Measure the operating point.

Questions for the Lab Report

Compare BJT and JFET (in terms of characteristics, applications, merits and demerits but not constructional details)