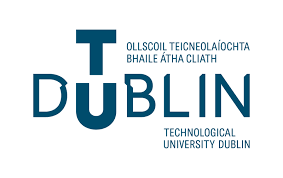
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SCHOOL OF ELECTRICAL AND ELECTRONIC ENGINEERING

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Name of Module: ([Solid-State Electronics, ELTR2603](https://brightspace.tudublin.ie/d2l/home/179100))

**TU Dublin – Grangegorman**

**Lab 4: FERMI-DIRAC DISTRIBUTION & FERMI LEVEL AND CARRIER MOBILITY & DIFFUSION**

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# Laboratory Objectives

The purpose of this lab is to learn the following concepts of fermi-dirac distribution and fermi level:

* Fermi level, , and the occupation probability of quantum states by an electron.
* Temperature effect on electron distribution.

# Laboratory Procedure

## 2.1. Fermi-dirac Distribution and Fermi level

Running the “Section 1.5.2: Fermi-Dirac Distribution and Fermi Level” and varying the material energy gap, temperature, and doping level to observe the influence on carrier concentration.



* + 1. Material energy gap change

Material gap increases when energy (Eg) increases.

* + 1. n-, p- type doping levels increase
    2. temperature change

Timeline

Description automatically generated



Figure 1 - Temperature at 0 K

No electrons can be above the Fermi level at 0K, since none have energy above the Fermi level and there are no available energy states in band gap.



Figure 2 - High temperature

At high temperatures, some electrons can reach the conduction band and contribute to electric current.

## 2.2. Thickness of Polysilicon Resistor

## 2.3. Metal sheet resistance

# Conclusion

The

# References

**http://hyperphysics.phy-astr.gsu.edu/hbase/Solids/Fermi.html**