نموذج (هـ)

Summarized Course Description

Course number: ECE 344	Course name: Introduction to Nanoelectronics
لغة تدريس المقرر: English	Pre-requisites: ECE 342
Credit hours: 3 **(3-0-0)**	Course level: Level - 8

Course Description **وصف المقرر :**

Theory of current, voltage and resistance from atoms up. Electrons at the nanoscale. Principles of quantum mechanics, including quantization, the wave-particle duality, wavefunctions and Schrödinger's equation. Electronic properties of molecules, carbon nanotubes and crystals, including energy band formation and the origin of metals, insulators and semiconductors. Electron conduction. Ballistic transport. Derivation of Ohm's law. Ballistic vs bulk MOSFETs.

Course objectives **أهداف المقرر :**

1. Understand the basic principles that govern the operation and electrical characteristics of nanoelectronic devices.
2. Become familiar with the recent research being undertaken in nanoelectronics.
3. Examine the basic ideas and concepts required to understand current flow in nanodevices.

Course Outcomes **مخرجات التعليم:**

Upon completing the course, the student should be able to:

4. Clearly explain distinct phenomena that are important in nanoelectronic devices.
5. Describe the operating principles, merits, demerits and challenges of some of the futuristic nanoelectronic devices.
6. Compute a given parameter or physical quantity for a nanoelectronic device by applying appropriate equations or formula.
7. Describe the challenges of scaling of conventional MOSFETs and possible solutions.
8. Calculate information regarding the energy levels of structures used in nanodevices.

Textbook and references **الكتاب المقرر والمراجع المساندة:**

Text Book: Vladimir V. Mitin, Viatcheslav A. Kochelap and Michael A. Stroscio Frontmatter, Introduction to Nanoelectronics: Science, Nanotechnology, Engineering, and Applications, Cambridge textbooks, March 2012, isbn: 9781107403765

References:

M. Lundstrom and J. Guo, Nanoscale Transistors: Physics, Modeling, and Simulation, Springer 2006.

S. Datta, Quantum Transport: Atom to Transistor. Cambridge University Press 2005

Y. Tsividis, The MOS Transistor. Oxford University Press, 2nd edition 1999

R. Feynman, Lectures on Computation. Editors A.J.G. Hey and R.W. Allen, Addison-Wesley 1996.