

## Course: Hybrid Electronics 1-2-4059 2 CREDITS

### Course Staff:

Name	Role	address	Tel	Email
Dr. Bashouti Muhammad	Responsible lecturer	Building 26, Room 105	08 / 6596738	<a href="mailto:Bashouti@bgu.ac.il">Bashouti@bgu.ac.il</a>

### Components of the course grade:

**Exercises:** Submission of 10 home exercises is mandatory (out of 14). The score will be determined by the average of the 10 best exercises. (80 pts)

**Bonus:** In the course you will be given preparatory exercises, for each preparation exercise there will be an addition of 1 point to the final score.

**Final Homework:** 20 points

Reference material for the final exam - Formulas pages of the course. (Without personal extensions).

### Syllabus

Week	Syllabus per week
1	Hydrogenation of Si 2D surfaces
2,3	Deal Grove model
	Chemical reaction with Oxidized Si 2D
4-5	Chemical reaction with Oxide free Si 2D
	Chemical reaction on Si nanowires
6	XPS of Si2p
	XPS of C1s
7	Coverage of molecules on surfaces
8	Stability of molecules on Si
	Adsorption profile
9-10	Density of States
	Fermi Level
11	Band Theory
	Electronic properties
12-13	Chemical properties
	Optoelectronic molecules on Si
14	Hybrid FET Device
	Chemresistor and solar cells

### Bibliography in English:

#### Papers

- Bashouti, Y. M., Tung, R. T., Haick, H. (2009). Tuning Electrical Properties of Si Nanowire Field Effect Transistors by Molecular Engineering. *Small*. 5:2761-2769.
- Bashouti, Y. M., Stelzner, T., Berger, A., Christiansen, S., Haick, H. (2009). Covalent attachment of alkyl functionality to 50 nm silicon nanowires through a chlorination/alkylation process. *J. Phys. Chem. C*. 113:14823–14828.
- Sashchiuk, A., Amirav, L., Bashouti, M., Krueger, M., Sivan, U., Lifshitz, E. (2004). PbSe Nanocrystal Assemblies: Synthesis and Structural, Optical, and Electrical Characterization. *Nano Lett.* 4:159-165.
- Bashouti, Y. M., Pietsch, M. Brönstrup, G., Sivakov, V., Ristein, J., Christiansen, S. (2014). Heterojunction based hybrid silicon nanowire solar cell: surface termination, photoelectron and photoemission spectroscopy study. *Progress in Photovoltaics: Res. Appl.* 2:1050-1061.

#### Books

- Books – Functional Hybrid Materials. Editor(s): Pedro Gómez-Romero. Clément Sanchez. (2003).
- Semiconductor devices: physics and technology, S.M. Sze, M.K. Lee, Publisher: Wiley.