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| הפקולטה להנדסה כימיתע"ש וולפסון |  |  |
| The Wolfson Department of Chemical Engineering |  |  |

**Wolfson Department of Chemical Engineering Seminar**

**Seminar Zoom ID:** [**https://technion.zoom.us/j/94152023840**](https://technion.zoom.us/j/94152023840)

**Monday - November 4th 2024 at 13:30 (Israel time)**

**Title: “Synthesis and Intensification of Sustainable Energy Systems”**

**Dr. Jianping Li**

Sustainable energy transition requires efficient utilization and valorization of renewable energy and feedstocks, which requires innovative energy systems. Process intensification is an energy systems design concept with the prospects of transforming sustainable chemical manufacturing and decarbonization. It refers to any design activity that can substantially improve one (or more) of several performance metrics, including size, energy efficiency, waste and carbon emission, and safety. Process intensification can be achieved by combining physicochemical phenomena. State-of-art methods for the synthesis and integration of energy systems have focused on equipment-based process design. Limited work exists to systematically identify novel designs with intensification opportunity. Moreover, process intensification via the combination of physicochemical phenomena may not be as good as isolated phenomena interactions (non-intensification). The objective of this talk is to address two critical questions: (1) how to represent energy systems for the automatic generation and screening of intensification pathways, and (2) when process intensification is desirable.

In this talk, we present an explainable framework for the modeling, optimization, and analysis of energy systems to facilitate sustainable chemical manufacturing and decarbonization. To this end, unlike the equipment-based process design, we propose a building block-based representation approach for processes intensification to foster creativity at the conceptual design stage. The combination of diverse building blocks identifies intensification opportunities. The building block-based representation is modeled using an optimization formulation to synthesis energy systems. We applied the building block-based representation for integrated CO2 capture and electrochemical conversion, large-scale energy systems synthesis, and multi-objective process intensification. Furthermore, we leveraged machine learning to identify and understand synergistic domains where process intensification outperforms non-intensification through applications in bioproduct separation.