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|  |  |  הטכניון - מכון טכנולוגי לישראל TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY  |
| הפקולטה להנדסה כימיתע"ש וולפסון |  |  |
| The Wolfson Department of Chemical Engineering |  |  |

**Wolfson Department of Chemical Engineering Seminar**

**Wolfson Department of Chemical Engineering, Lecture Hall No. 6**

**Wednesday, November 17th, 2021, at 13:30**

**Predictive Tools for the Design of Encapsulated Assemblies: Validated Process Simulation and Failure Criteria**

**Mor Politi**

**PhD Seminar**

Advisors: Prof. Yachin Cohen

Dr. Orna Breuer

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Reliable numerical predictive tools are instrumental in the high-end and robust design of encapsulated electronic assemblies. The use of epoxy-based compounds as encapsulants presents some challenges in establishing such tools. Process optimization and residual stress calculations require a rigorous cure simulation, which considers the transient chemical, thermal and mechanical constitutive behavior of the curing resin. Failure prediction and design margin estimation require extensive failure criteria calibration, as the latter is highly dependent on temperature, strain rate and stress state. The prediction of failure becomes even more difficult when considering a highly divergent stress field and model singularities. This research aims to establish computational tools and experimental methodologies for the reliable prediction of the residual stresses and failure of a thermoset encapsulant, and their incorporation in process design.

To this end, we study the development of residual stresses and strains in an epoxy based encapsulant using a finite element cure process analysis. The analysis is validated using a specially designed test specimen, employing various strain sensing techniques, for which we observe good compatibility between experimental results and numerical predictions.

For the prediction of failure under highly divergent stress states, we propose and experimentally calibrate a probabilistic volume-sensitive failure model. The model consistently predicts the failure variability of the test specimen used for calibration and is successfully validated using an additional test-case subjected to a different stress state.

**Refreshments will be served at 13:15**