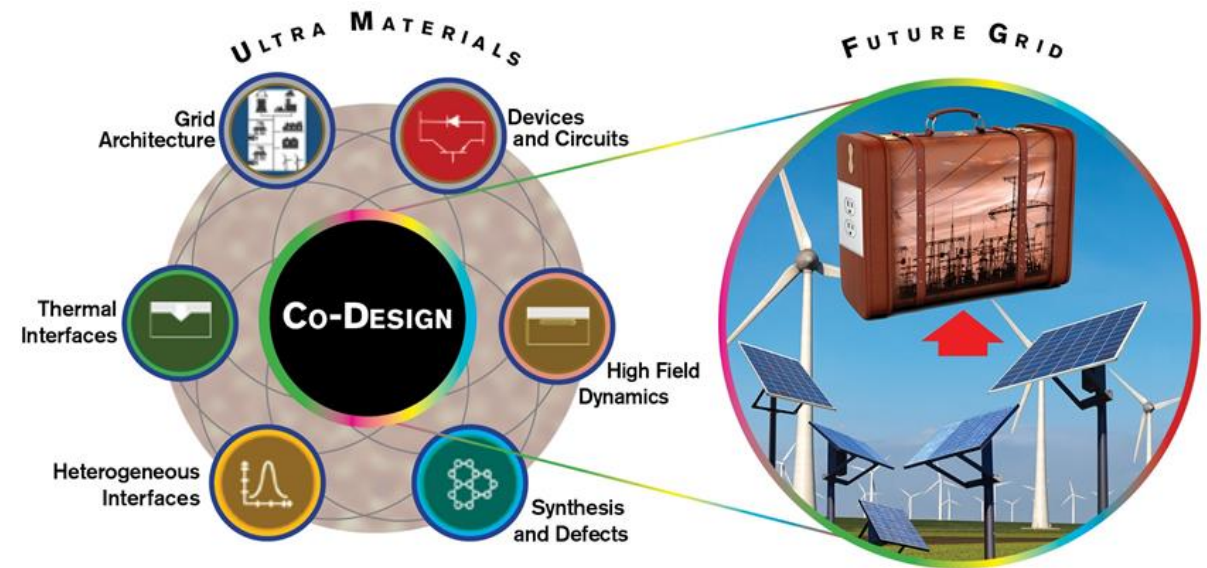


# Ultra Materials for a Resilient, Smart Electricity Grid (ULTRA)

Robert J. Nemanich (Arizona State University); Class: 2020-2024

**MISSION:** To achieve extreme electrical properties and phenomena through fundamental understanding of ultra wide bandgap materials – including synthesis and impurity incorporation, electronic structure at interfaces, electron-phonon interactions at high fields, and phonon mediated thermal transport, which will enable a resilient, smart electricity grid.



<https://ultracenter.asu.edu/>

## RESEARCH PLAN

Specific outcomes will include: 1) synthesis of cubic and hexagonal ultra semiconductors, 2) experimental and theoretical understanding of defects and doping that transcends the materials systems, 3) characterized ultra heterostructures enabling new routes to doping, 4) understanding electric breakdown phenomena and high current transport in ultra semiconductors, and 5) characterized interactions between electrons and phonons in ultra materials and importantly, their interfaces.