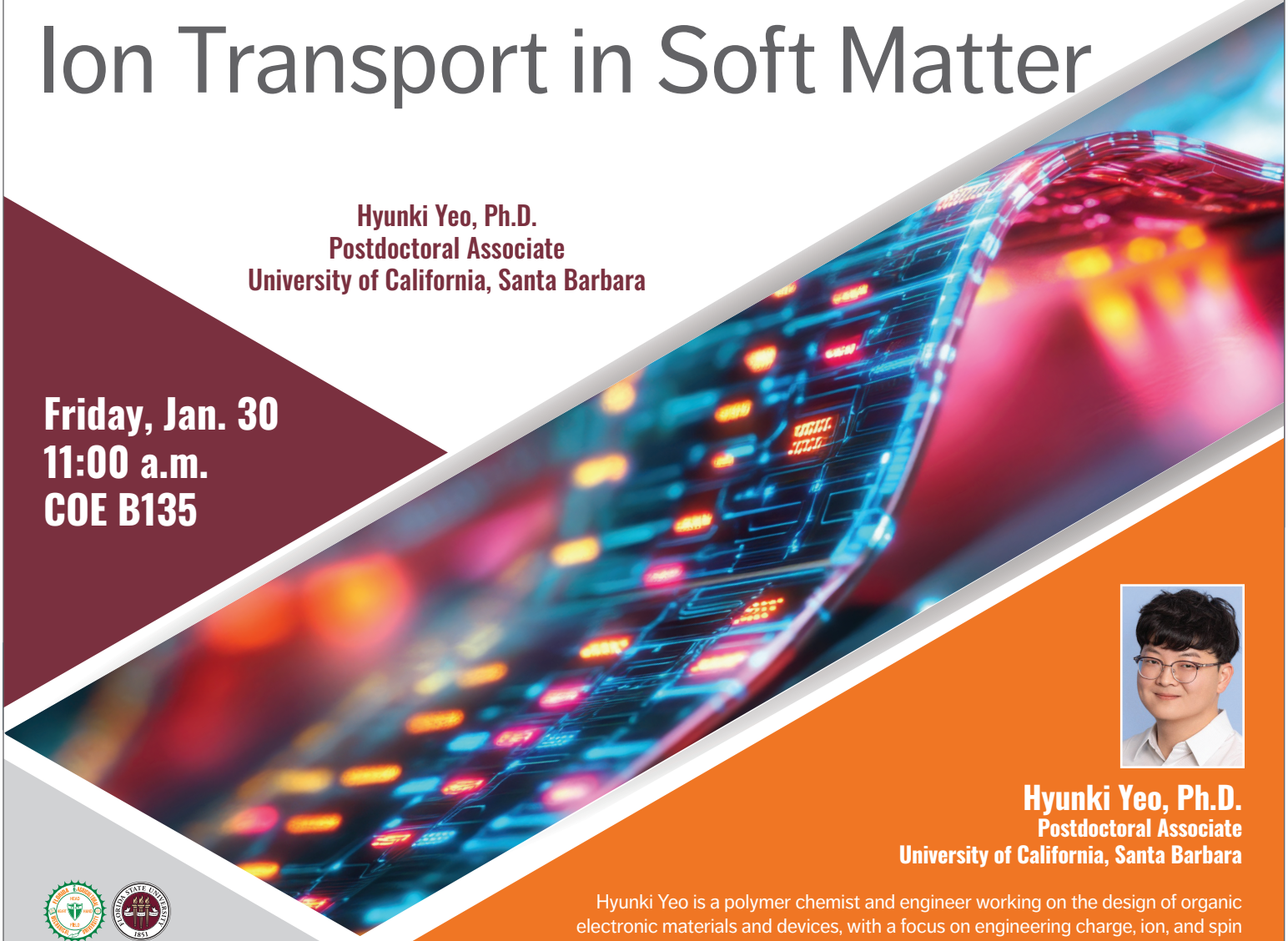
CHEMICAL & BIOMEDICAL ENGINEERING SEMINAR ANNOUNCEMENT

Engineering Charge, Spin, and Ion Transport in Soft Matter

Hyunki Yeo, Ph.D.
Postdoctoral Associate
University of California, Santa Barbara

Friday, Jan. 30
11:00 a.m.
COE B135



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Hyunki Yeo is a polymer chemist and engineer working on the design of organic electronic materials and devices, with a focus on engineering charge, ion, and spin transport. He received his Ph.D. from the Davidson School of Chemical Engineering at Purdue University, where his doctoral research centered on conductive and open-shell polymers for electronic and spin-responsive applications. He is currently a postdoctoral fellow at the University of California, Santa Barbara, where his work explores self-doped conjugated polyelectrolytes, organic mixed ionic–electronic conductors (OMEICs), and electrostatically complexed polymer blends. His broader research vision applies chemical engineering principles to overcome dynamic transport limitations in sustainable and functional materials, organic spintronics, and bio-derived polymer systems. He is deeply committed to mentoring students and fostering an inclusive, collaborative research environment towards his independent carrier.

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The next breakthroughs in energy storage, spintronics, and bio-integrated organic electronics will be driven not only by advances in conventional electronics but by a new generation of soft materials capable of transporting charge, spin, and ions. In these systems, transport modes are inherently coupled (e.g., electrons carry spin, counterions accompany charge carriers, and presence of static charge influences electronic states), yet materials are rarely designed with this interplay in mind. This research seminar addresses these opportunities through the design of functionalized conductive polymers that redefine transport in soft matter.

The seminar will demonstrate that non-conjugated radical systems enabled by single-occupied molecular orbitals act as intrinsically paramagnetic platforms for organic spintronics. Their spin response is tunable through spatial overlap of radical centers, including control over crystal packing and stereoregularity. In parallel, self-doped conjugated polymers that can achieve high electronic conductivity (~ 500 S cm-1) will be introduced, that offers greater flexibility in processing and complexation strategies with biopolymers. Grounded in polymer chemistry and solid-state device fabrication, this work establishes molecular-level design rules for engineering ionic–electronic spinterfaces in multifunctional organic materials.