OpSIS Silicon Photonics
Sub-System Design workshop

Syllabus: (preliminary)

Day 1 – *Intro to OpSIS-IME PDK and design*	• Introduction to Silicon Photonics and OpSIS • OpSIS-IME Fabrication process description, Process Design Kit in Mentor Graphics, rules, GDS layers, Library • Schematic Driven Layout using Mentor Graphics Pyxis • System modelling using Lumerical INTERCONNECT
Day 2 – *System design and mask layout*	• System design of a WDM optical link: optical transmission spectrum, optical link parameters (ER, IL, cross-talk, etc.), time domain: eye diagrams, bit error rate • Mask Layout tutorial using Mentor Graphics Pyxis: cell instances, cell devices; circuit layout using interactive routing (iRoute); • Interactive and sign-off Design Rule Checking (DRC) using Mentor Graphics Calibre • Mentor Graphics Pyxis scripted "PCell" devices, tutorial on writing a ring resonator device • Design For Manufacture (DFM): Tiling using Mentor Graphics
Day 3 – *Optics and coupling*	• Waveguides, directional couplers, bends, grating and edge couplers • Directional Couplers Tutorial using Lumerical MODE • Grating Couplers Tutorial 2D FDTD, 3D FDTD with GDS import • Fiber packaging
Day 4 – *Detectors and PN junction phase modulator*	• Ge PIN detector; IME detector performance; layout • PN junction basics: junctions and waveguides to find Δn, alpha dB/cm versus voltage; Matlab 1D compact model; performance variations with parameters • PN junction and modulator modelling tutorial; Lumerical 2D MODE/DEVICE
Day 5 – *Ring and Travelling-wave Modulators, Design for Test*	• Ring modulators: optical transfer function vs. Δn; critical coupling, single-bus vs. double-bus, choosing the right coupling coefficient; insertion loss and extinction ratio • Lumerical INTERCONNECT ring modulator • Mach-Zehnder Interferometer modulator: optical transfer function for Δn and alpha; Microwave electrode impedance, velocity, microwave loss, velocity matching for travelling wave modulators; • Best practices for design, layout, and testability • Test setup: Parts list and description of automated grating-coupled system