

Syllabus:

<p>Day 1 – <i>Intro to OpSIS- IME PDK and optical simulations</i></p>	<ul style="list-style-type: none"> • Introduction to Silicon Photonics and OpSIS • OpSIS-IME Fabrication process description, Process Design Kit in Mentor Graphics, rules, GDS layers, Library • Lumerical tools overview for silicon photonics • Waveguides, directional couplers (tutorial in MODE, 3D FDTD)
<p>Day 2 – <i>Mask layout, test circuits</i></p>	<ul style="list-style-type: none"> • Mask Layout tutorial using Mentor Graphics Pyxis: cell instancing; circuit layout using interactive routing (iRoute); Layout of a thermo-optic Mach-Zehnder switch • Interactive and sign-off Design Rule Checking (DRC) using Mentor Graphics Calibre • Grating Couplers (Tutorial 2D FDTD and Pyxis Layout)
<p>Day 3 – <i>Modulators</i></p>	<ul style="list-style-type: none"> • High-speed ring and MZI modulators; PN junction basics • Mentor Graphics Pyxis scripted "PCell" devices, tutorial on writing a ring resonator device; test cell layout • PN junction and modulator modeling tutorial; Lumerical 2D MODE/DEVICE; junctions and waveguides to find Δn, alpha dB/cm versus voltage • Ring modulators: optical transfer function vs. Δn; critical coupling, single-bus vs. double-bus, choosing the right coupling coefficient; insertion loss and extinction ratio; modulation response (Lumerical INTERCONNECT) • Layout of ring modulator test structures, including thermal tuning
<p>Day 4 – <i>Travelling-wave</i></p>	<ul style="list-style-type: none"> • Mach-Zehnder Interferometer modulator: optical transfer function for Δn and alpha; Microwave electrode impedance,
<p><i>Modulator, Detectors, Design for Test and packaging</i></p>	<p>velocity, microwave loss, velocity matching for travelling wave modulators;</p> <ul style="list-style-type: none"> • Ge PIN detector; IME detector performance • Layout of an on-chip optical communication link • PIN Phase shifter • Test setup: Parts list and description of automated grating-coupled system • Edge coupling • Fiber packaging • Best practices for design, layout, and testability
<p>Day 5 – <i>Design for Test, Systems</i></p>	<ul style="list-style-type: none"> • Design For Manufacture (DFM): Tiling using Mentor Graphics • Schematic Driven Layout using Mentor Graphics Pyxis • System modeling using Lumerical INTERCONNECT – 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