1. Explain intuitively why the effective index of a strip waveguide typically decreases with wavelength.
2. Explain intuitively why the effective index of a strip waveguide typically increases as the waveguide width is increased.
3. Explain intuitively why the group index of a strip waveguide typically decreases as the waveguide width is increased (e.g. from 400 nm to 600 nm).
4. Design a waveguide with zero group velocity dispersion at 1550 nm.
5. Design a grating coupler for TM 1310 nm (straight fingers), for an incident angle

of 10◦.

1. Design a grating coupler for TM 1310 nm (focusing).
2. Design and optimize an edge coupler for TE 1310 nm operation, coupled to an ideal lens assembly.
3. Determine the thermal tuning efficiency for a thermal phase shifter where the heater is embedded in the waveguide via a N++/N/N++ region. Assume the waveguide is a rib waveguide with a 10 μm slab width, 90 nm slab thickness, with a ridge that is 0.5 μm width and 220 nm thick.
4. Consider a ring resonator with 220 nm × 500 nm strip waveguides that is uniformly heated. Determine an expression for the wavelength shift versus temperature, i.e. *dλ/dT*, at 1550 nm. How does this vary with the radius of the ring resonator?