

Exercise "Optoelectronic Devices"

1) A symmetric slab waveguide, which is shown in the figure below, is made of a polymer core layer of thickness $d = 1.0\mu\text{m}$ and is sandwiched between silica as a cladding. Find the propagation constant, effective refractive index and plot the TE mode profiles (E_y) for each existing mode by analytical calculations for $1.0\mu\text{m}$ wavelength. Please use $\bar{n}_2=1.77$ for the polymer guiding layer and $\bar{n}_1=1.45$ for silica.

Hint: To solve the 1-D Helmholtz equation, please make an Ansatz for your core and cladding region.

Apply the boundary condition that the tangential components of \vec{E} and \vec{H} are continuous.

Draw the effective refractive index solutions (eigenvalues) in to the $\bar{n}(x)$ profile and draw the Eigen functions in x-direction. Also solve the transcendental equation graphically.

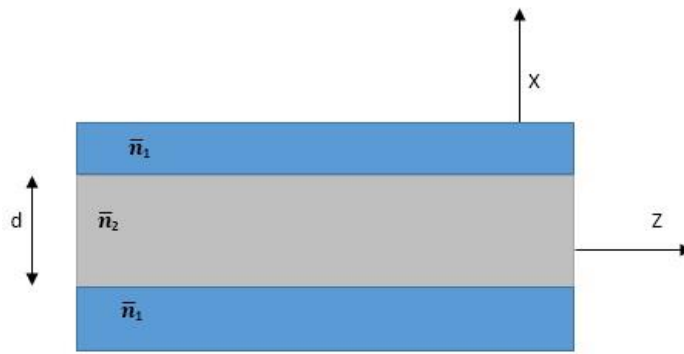


Fig: Cross sectional view of a dielectric slab waveguide