

# 3D Eigenvalue Problems

PDEs (must be linear):

$$\begin{aligned} F_1(x, y, z, U_1, U_{1x}, U_{1y}, U_{1z}, U_{1xx}, U_{1yy}, U_{1zz}, U_{1xy}, U_{1xz}, U_{1yz}, \dots) &= \\ & \lambda_{\rho_{11}}(x, y, z)U_1 + \dots + \lambda_{\rho_{1N}}(x, y, z)U_N \\ &= \\ &= \\ F_N(x, y, z, U_1, U_{1x}, U_{1y}, U_{1z}, U_{1xx}, U_{1yy}, U_{1zz}, U_{1xy}, U_{1xz}, U_{1yz}, \dots) &= \\ & \lambda_{\rho_{N1}}(x, y, z)U_1 + \dots + \lambda_{\rho_{NN}}(x, y, z)U_N \end{aligned}$$

Boundary conditions:

$$\begin{aligned} G_1(x, y, z, U_1, U_{1x}, U_{1y}, U_{1z}, \dots, U_N, U_{Nx}, U_{Ny}, U_{Nz}) &= 0 \\ &= \\ &= \\ G_N(x, y, z, U_1, U_{1x}, U_{1y}, U_{1z}, \dots, U_N, U_{Nx}, U_{Ny}, U_{Nz}) &= 0 \end{aligned}$$

(periodic and "no" boundary conditions are also permitted)