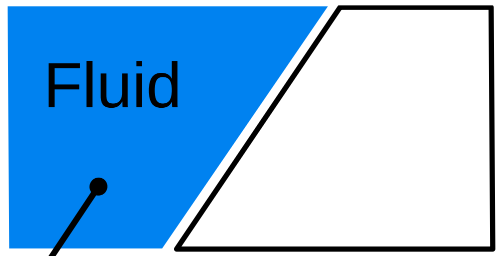
EQUATIONS IN THE FLUID DOMAIN



Mass Balance

$$div\,\underline{U} = 0$$

Momentum Balance

$$\rho \frac{d\underline{U}}{dt} = -\rho\, g\underline{e}_Z - \underline{\nabla} p + \mu \Delta \underline{U}$$

EQUATIONS IN THE SOLID DOMAIN

Continuum mechanics

Modal approximation

Single mode approximation

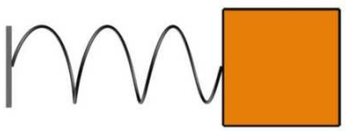
SINGLE MODE APPROXIMATION IN THE SOLID DOMAIN

$$\underline{\xi}(\underline{x},t)=q(t)\underline{\varphi}(\underline{x})$$

Modal displacement

Modal shape

SINGLE MODE APPROXIMATION IN THE SOLID DOMAIN



$\underline{e}_X$

$$\underline{\xi}(\underline{x},t) = q(t)\underline{\varphi}(\underline{x})$$

Modal displacement

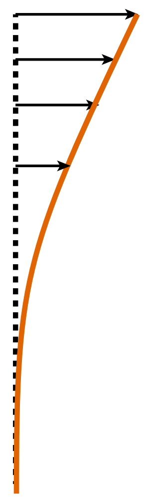
Modal shape

$$\underline{\varphi}(\underline{x}) = \underline{e}_X$$

SINGLE MODE APPROXIMATION IN THE SOLID DOMAIN

$$\underline{\xi}(\underline{x},t)=q(t)\underline{\varphi}(\underline{x})$$

Modal shape



MODAL EQUATIONS IN THE SOLID DOMAIN

$$\underline{\xi}(\underline{x},t)=q(t)\underline{\varphi}(\underline{x})$$

Modal displacement (unknown)

$$m\frac{d^2q}{dt^2}+kq=f$$

Modal shape (known)

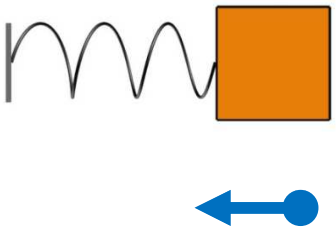
MODAL EQUATIONS   IN THE SOLID DOMAIN

$$m\frac{d^2q}{dt^2}+kq=f$$

Modal mass (known)

Modal stiffness (known)

Modal load (known)



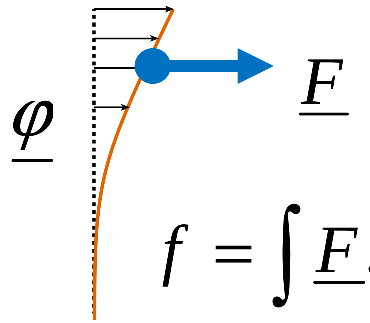
$\underline{F}$

$$f=\underline{F}.\underline{e}_X$$

MODAL EQUATIONS IN THE SOLID DOMAIN

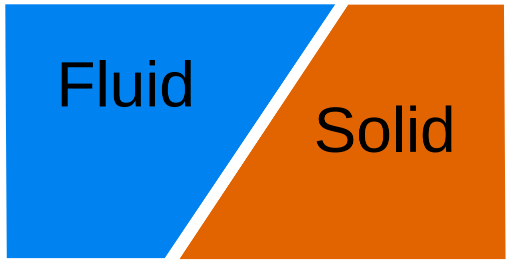
$$m\frac{d^2q}{dt^2} + kq = f$$

Modal mass (known)	Modal stiffness (known)	Modal load (known)



$$f = \int \underline{F}.\underline{\varphi}\, dx$$

FLUID AND SOLID



Mass Balance

$$\mathit{div}\,\underline{U} = 0$$

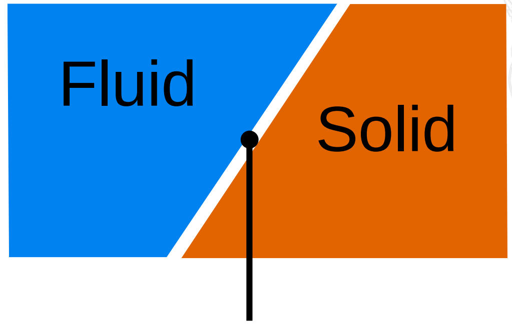
Momentum Balance

$$\rho \frac{d\underline{U}}{dt} = -\rho\, g\underline{e}_z - \underline{\nabla} p + \mu \Delta \underline{U}$$

$$\underline{\xi}(\underline{x}, t) = q(t)\underline{\varphi}(\underline{x})$$

$$m \frac{d^2 q}{dt^2} + kq = f$$

AT THE INTERFACE

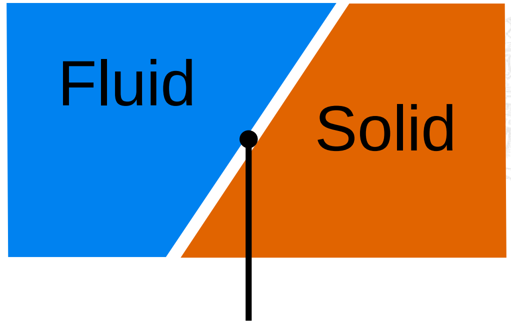


Kinematic condition

$$\underline{U} = \frac{\partial \underline{\xi}}{\partial t}$$

$$\boxed{\underline{U}(\underline{x},t) = \frac{dq}{dt}(t)\,\underline{\varphi}(\underline{x})}$$

AT THE INTERFACE



Dynamic condition

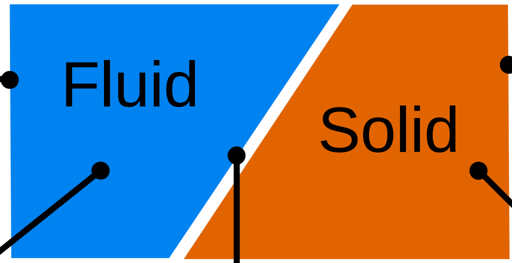
$$\left[-p\underline{\underline{I}}+\mu\left(\nabla\underline{U}+\nabla^{t}\underline{U}\right)\right].\underline{n}$$

$$\int_{Interface}\left\{\left[-p\underline{\underline{I}}+\mu\left(\nabla\underline{U}+\nabla^{t}\underline{U}\right)\right].\underline{n}\right\}.\underline{\varphi}\,dS=f$$

FLUID AND SOLID

Fluid boundary conditions

Solid boundary conditions



$$\mathrm{div}\,\underline{U} = 0$$

$$\rho \frac{d\underline{U}}{dt} = -\rho\, g\underline{e}_Z - \underline{\nabla} p + \mu \Delta \underline{U}$$

$$m\frac{d^2 q}{dt^2} + kq = f$$

$$\underline{U}(\underline{x}, t) = \frac{dq}{dt}(t)\,\underline{\varphi}(\underline{x})$$

$$\int_{Interface} \left\{ \left[-p\underline{\underline{I}} + \mu\left(\nabla\underline{U} + \nabla^t \underline{U}\right)\right].\underline{n} \right\}.\underline{\varphi}\, dS = f$$