

EART160: Equations You Should Know (in addition to high school physics)

Gravity and impacts

Newton's law	$F=GMm/r^2$	Surface gravity	$g=GM/R^2$
Escape velocity	$v=(2gR)^{1/2}$	Gravitational potential	$U=-GM/r$
Orbital period	$GM=a^3 \omega^2$		

Flexure and Stresses

Hooke's law	$\sigma=E\varepsilon$	Thermal expansion	$\varepsilon=\alpha\Delta T$
Flexural parameter	$\alpha = \left[\frac{ET_e^3}{3g(\rho_m - \rho_w)(1-\nu^2)} \right]^{1/4}$		

Interiors

Hydrostatic assumption	$dP=(-)\rho g dz$	Heat flow	$F=k dT/dz$
Specific heat capacity	$E=mC_p\Delta T$	Rayleigh number	$Ra = \frac{\rho g \alpha \Delta T d^3}{\kappa \eta}$
Thermal diffusivity	$\kappa=k/\rho C_p$	Diffusion timescale	$t=d^2/\kappa$

Atmospheres

Black-body radiation	$F=\varepsilon\sigma T^4$	Gas law	$PV=P\mu/\rho=RT$
Scale height	$H=RT/g\mu$	Coriolis acceleration	$a=2v\omega \sin\theta$