EOSC 256 Final exam study guide. For material from before the midterm (25% of the final exam), please refer to the midterm study guide.

I will provide equations with the exam (at the end). I will not identify the equations (what they are for), or the terms in the equations, but you should be able to recognize and use them.

As with the midterm exam, most questions are on the lecture material, things we did in class, and homework assignments. Only very short computations are required.

This list is not comprehensive. I may have missed a topic or two. These topics are for E. Hearn. About 2/3 of the exam questions will be from Hearn and about 1/3 will be from Bostock.

Seismicity statistics, Gutenberg-Richter relationship, relative number of big and small earthquakes. What the a and b values are. Seismic moment, moment magnitude, scaling of moment with length, slip, etc.

Lithostatic and deviatoric stresses in the Earth.

Shear stress, normal stress, friction coefficient, Coulomb failure criterion, Byerlee's Law.

Principal stresses, Mohr's Circle and failure envelope.

Pore pressure and effective normal stress.

Slip weakening and "rate-and-state" friction. Importance of velocity (or slip) weakening for instability (earthquake). Stick slip.

Depth dependence of (a-b) (velocity weakening parameter). Lack of hypcentres below about 20 km (except in subducting slabs).

Stability criterion, minimum size of slipping fault patch for instability.

Spring-slider model, idea that elastic forces driving slip on the fault actually decrease during sliding (because the spring shortens), so the shear stress no longer exceeds the frictional resisting force and this stops sliding. Also the chaotic "earthquakes" (unpredictable exact timing) even for this simple model.

Required conditions for an earthquake: Coulomb criterion, velocity-weakening friction, and minimum slipping patch size (it is just a slowly creeping patch until it gets large enough to go unstable).

Conditions that encourage a large earthquake (all look the same at the very beginning - some grow large and others do not).

Human-triggered seismicity (surface loads and water seepage or injection). Opposite action (water withdrawal from fault zone, increase in surface load above a reverse fault) could theoretically delay earthquakes (temporarily, because elastic stress is always building up!).

Stress shadows and triggering (or suppressing) of earthquakes (e.g., post-1906 "quiet" time in California.)

Forecasting earthquakes - three types of forecasts. Recurrence interval and the importance of the standard deviation of the recurrence interval to earthquake probability estimates. What we need to know to forecast (estimate probabilities over set time intervals, for a specific fault).

Student questions from day 1 of class - you should be able to answer them (except 6 - unclear) after studying your notes and completed homeworks/reading questions.