

EESC UN3201 Syllabus: Solid Earth Dynamics, Spring 2023
Prof. Bill Menke
TR 1:10pm - 2:25pm in Sch 603

Lecture Schedule (subject to revision)

Week 1

1. Tuesday, Jan 17, Introduction: What is dynamics and why is it intellectually important?
2. Thursday, Jan 19, Heat flow: Sources of heat, modes of heat transport

Week 2

3. Tuesday, Jan 24, Heat flow: Cooling of a house, cooking an ostrich egg, cooling a dike
4. Thursday, Jan 26, Heat flow: Cooling of the oceanic lithosphere; periodic temperature variations

Week 3

5. Tuesday, Jan 31, Heat flow: Kelvin and the age of the Earth; convection
6. Thursday, Feb 2, Heat flow: viscosity, convection, mantle circulation; thermal structure of Earth

Week 4

7. Tuesday, Feb 7, Gravity: Newton, field of a point mass; measuring gravity; shape of the Earth
8. Thursday, Feb 9, Gravity: Latitudinal dependence of gravity; perturbations to the gravity field: 'free air' and 'Bouguer' gravity anomalies

Week 5

9. Tuesday, Feb 14, Gravity: gravity anomalies from simple shapes; missing mass of mountains
10. Thursday, Feb 16, Isostasy: Archimedes' principle and icebergs

Week 6

11. Tuesday, Feb 21 Isostasy: mountains and sediments (Airy); seafloor cooling again (Pratt)
12. Thursday, Feb 23 Isostasy: glacial rebound, viscosity and flow

Week 7

13. Tuesday, Feb 28 Gravity/Isostasy: Earth's gravity field, lithospheric flexure
14. Thursday, Mar 2 Gravity: the geoid and the tides

Week 8

15. Tuesday, Mar 6, Midterm exam
16. Thursday, Mar 8, Deformation: stress and strain, modes of deformation

Week 9, Monday, March 13, 2023 to Friday, Mar 17, Spring Break

Week 10

- 17. Tuesday, Mar 21, Seismology: seismic waves and Snell's law
- 18. Thursday, Mar 23, Seismology/Structure: imaging techniques, structure of the Earth

Week 11

- 19. Tuesday, Mar 28. Seismology/Earthquakes: elastic rebound, locating earthquakes, fault geometry, earthquake size
- 20. Thursday, Mar 30, Seismology/Earthquakes: measuring seismic waves; magnitude-frequency distribution; focal mechanisms

Week 12

- 21. Tuesday, Apr 4, Seismology/Earthquakes: global seismotectonics, shallow and deep
- 22. Thursday, Apr 6, Geomagnetism: Earth's magnetic field; the magnetic dipole, inclination and declination; the dynamo

Week 13

- 23. Tuesday, Apr 11, Geomagnetism: rock magnetism, reconstruction of geologic history
- 24. Thursday, Apr 13, Geomagnetism: the external field, induced magnetism

Week 14

- 25. Tuesday, Apr 18, Glaciers: gravity-driven piles of ice; flow and fracture, strain
- 26. Thursday, Apr 20, Glaciers: glacier speed; heat flow in ice sheets

Week 15

- 27. Tuesday, Apr 25, Glaciers: short-time-scale flow variations; seismic signals in ice
- 28. Thursday, Apr 27, Review

Tuesday May 9, 1:10-4:00pm, Final Exam (Registrar's projected exam schedule)