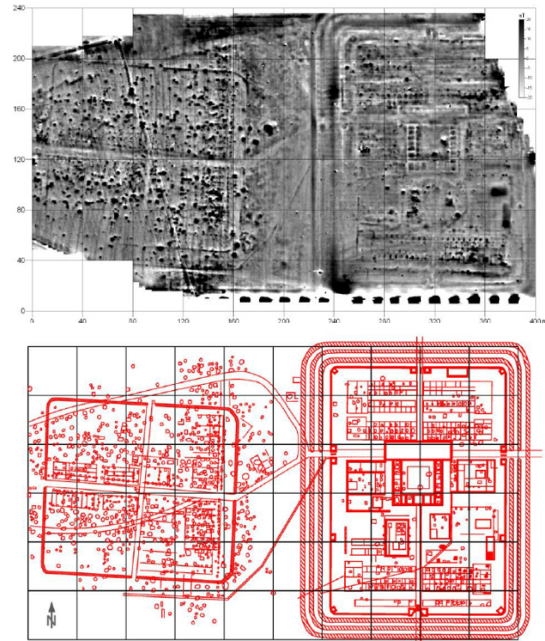
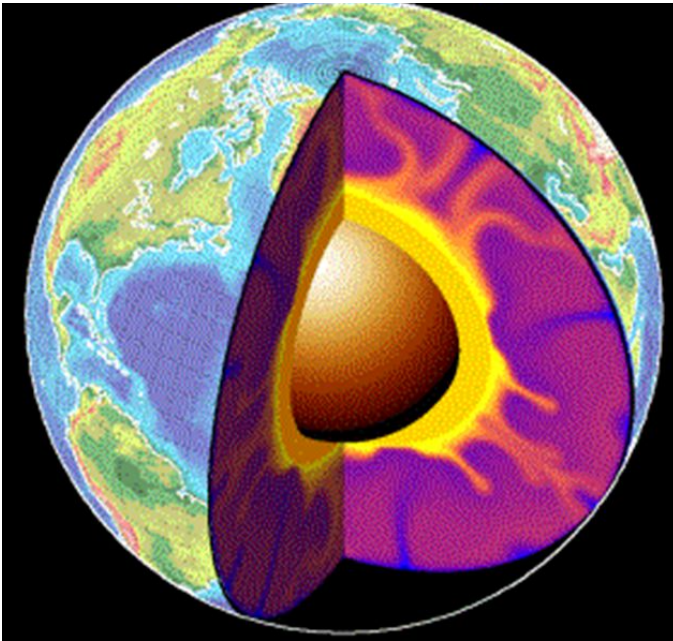


ERTH 304 - Physics of the Earth and Planets

Did you know the Earth's Core Helps Us Map Underground Archeological Sites?



Archeological image and map of the buried Roman fort of Theilenhofen

Course Description: The Earth's orbit, shape, interior structure, and geological evolution are the result of the interaction between Earth materials and a few physical laws, such as those of gravity, elasticity, electromagnetism, and heat transfer. In this class we will explore these interactions and use them to understand the basic physics and structure of the Earth and other planets. A primary objective of this course is to emphasize theory, principles, and practical techniques of geophysics to investigate the internal structure of the Earth on a wide range of scales. Applications include core dynamics, mantle dynamics, plate tectonics, volcanic systems, hydrologic systems, and archeology. Labs include field surveys and computer analyses and a group research project.

Instructor: Professor Robert Dunn
Office hours: After class
Class Meetings: T/TH 10:30-11:45
Text: Lillie, Whole Earth Geophysics

Email: dunnr@hawaii.edu

Lab: M 13:30-16:20

Course Topics

The Powerful Realm of Geophysics
Fundamental Forces of Nature, Matter, and the Formation of the Solar System
Internal Structure of the Sun and the Solar Wind
Earth and Moon Formation, Orbit, Rotation, and Wobble
Basics of Planetary Structure
Earth's Dynamics, Heat Flow, & Rheology
Gravitational Fields and Earth's Gravity, Geoid, Tides
Gravity Field Data Collection, Processing, and Mapping Earth's Structure
Geomagnetic Fields and Earth's Three Main Fields
Magnetic Field Data Collection, Processing, and Mapping Earth's Structure
Electrical Fields and the Principle Geoelectrical fields
Geoelectrical Data Collection, Processing, and Mapping Earth's Structure
Elasticity and the Fundamentals of Seismology
Seismic Refraction Theory and Methods
Seismic Refraction Data Collection, Processing, and Imaging Earth's Structure
Seismic Reflection Theory and Methods
Seismic Reflection Data Collection, Processing, and Imaging Earth's Structure
Acoustical mapping of Ocean Structure and the Seafloor
Geodetical Tools, LIDAR, and Ground Penetrating Radar

Course Structure: Two lectures and one lab per week. Lecture includes class participation, small group activities, problem solving. Lab includes computer-based and outdoor activities. A large part of the course involves a geophysical field project.

Grading: Homework and labs, project report, one midterm, and one final exam. The relative weightings are approximately: Homework + Lab + Course Participation 30%; Project Report 50%. Mid-Term + Final: 20%. Make-Up Exams/Early Exams: Make-up exams will not be given except when a student misses the exam for a legitimate reason such as illness or family emergency (a doctor's note or other documentation is required). Please get in touch with your instructor as soon as possible if such a situation arises. Anyone with sporting event conflicts must provide at least 2 weeks written notice with appropriate signed paperwork. Note that make-up and/or early exams will be essay format.

Questions: Questions are welcome and help everyone. Please ask questions freely!

Learning Objectives: The Department of Earth Sciences has established the following undergraduate student learning objectives. Each of these objectives is relevant to this course.

1. Students can explain the relevance of geology and geophysics to human needs, including those appropriate to Hawaii, and be able to discuss issues related to geology and its impact on society and planet Earth.
2. Students can apply technical knowledge of relevant computer applications, laboratory methods, and field methods to solve real-world problems in geology and geophysics.

3. Students use the scientific method to define, critically analyze, and solve a problem in earth science.
4. Students can reconstruct, clearly and ethically, geological knowledge in both oral presentations and written reports.
5. Students can evaluate, interpret, and summarize the basic principles of geology and geophysics, including the fundamental tenets of the sub-disciplines, and their context in relationship to other core sciences, to explain complex phenomena in geology and geophysics.

Assignments: Assignments are due at the beginning of class one week after they are assigned (unless otherwise stated). Late assignments receive no points.

Format: Neatness, clarity of expression, and completeness are essential to obtain full credit on exams, reports, and homework. Please make sure to:

- (1) Specify known and unknown information. Write out the equations, or derive new ones, that you will use to solve the problem. Explain your reasoning.
- (2) Draw illustrative figures that describe the problem.
- (3) Show clearly how you solved the problem.
- (4) Check your answer – does your solution make physical sense? Check the units.

Report Write-up: (1) Matlab Codes: Include a copy of any code at the end of your write-up; don't bury results within the code. What you did should be clear from the write-up. (2) Completeness. A good rule of thumb is to include enough information so that a reader could take your data and reproduce what you did using the information that you provide. Be concise and complete. (3) Format. Your write-up will consist of neatly written parts, in the order in which they are specified. Present your results in the proper format for scientific writing – with labeled sections "Introduction", "Methods", "Results", and "Discussion and Conclusions" (unless instructions indicate otherwise). (4) Figures: All figures should be clearly labeled (Fig. 1., Fig. 2a, Fig. 2b, etc.) and these labels should be used when referring to the figure in the text. Figures axes need to be labelled, with units, and multiple lines included in the same plot should be clearly distinguished by labels or legends.

Cooperation: Collaboration between students is encouraged in order to discuss approaches to solving problems. However, work out the problems on your own and write out the solutions yourself. Anyone who shares their homework solutions openly is inviting others to copy it. Both will receive a zero on the assignment and both will be referred to UH's Office of Student Conduct for disciplinary action.

Mānoa Career Center: The Mānoa Career Center partners with faculty and employers to empower UH Mānoa students to engage in career life planning. Mānoa Career Center supports students and alumni in their career and personal development through awareness, exploration, experience, and reflection in university and non-university work-based learning opportunities. Some of the major programs and services include: career counseling, career planning sessions and workshops, graduate school planning, Co-operative Education and internships, part-time and full-time employment including Federal Work Study and campus recruitment, information sessions, and career fairs. For more information, please visit the Mānoa Career Center web site at: <http://manoa.hawaii.edu/careercenter/>.

Counseling & Student Development Center: Counseling and Student Development Center (CSDC) offers an array of services to meet counseling and testing needs among students, staff, and faculty of the UH Mānoa campus. Our multidisciplinary staff includes psychologists, psychiatrists, graduate-level therapists, and counselor trainees. It is our mission to uphold excellence in quality of care that is respectful to the socio-cultural diversity of our clientele. We offer walk-in, individual, and group counseling, as well as career and psychological assessments. When a client's needs could be best addressed by providers outside of the CSDC, we offer appropriate referrals in the community. We also provide outreach events to increase awareness on issues relevant to healthy campus lifestyle. For more information, please visit the Counseling & Student Development Center web site at: <http://www.manoa.hawaii.edu/counseling/>.

Basic Needs: Basic needs include food and housing, childcare, mental health, financial resources and transportation, among others. Student basic needs security is critical for ensuring strong academic performance, persistence and graduation and overall student well-being. If you or someone you know are experiencing basic needs insecurity, please see UH System Basic Needs at: <https://www.hawaii.edu/student-basic-needs/>

Disability Access: If you have a disability and related access needs the Department will make every effort to assist and support you. For confidential services students are encouraged to contact the Office for Students with Disabilities (known as “Kokua”) located on the ground floor (Room 013) of the Queen Lili'uokalani Center for Student Services: KOKUA Program; 2600 Campus Road; Honolulu, Hawaii 96822. Voice: 956-7511; Email: kokua@hawaii.edu; URL: www.hawaii.edu/kokua

Title IX: The University of Hawai'i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you. Staff can also direct you to resources that are in the community. Here are some of your options: As members of the University faculty, your instructors are required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator. Although the Title IX Coordinator and your instructors cannot guarantee confidentiality, you will still have options about how your case will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.

If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, use the confidential resources available here:

<http://www.manoa.hawaii.edu/titleix/resources.html#confidential>

If you wish to directly REPORT an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence or stalking as well as receive information and support, contact: Dee Uwono Title IX Coordinator (808) 956-2299 t9uhm@hawaii.edu.

I have read and understand the content of this syllabus:

Print Name: _____

Signature: _____

Date: _____