

Course Description and Syllabus
GEOL 4/52074 Environmental Core and Well Logging
Kent State University Department of Geology
Fall 2009

(<http://www.personal.kent.edu/~jortiz/envlogging/>)

Instructor: Dr. Joseph D. Ortiz
 Office: McGilvrey 334/336C
 Phone: 330-672-2225
 Email: jortiz@kent.edu
 Mailbox: Dept. of Geology Main Office (McGilvrey 221)

Lecture: MWF, 9:55-10:45 pm, Room 311 McGilvrey Hall
Office Hours: T: 10:30-11:30 am, W: 2:15-4:00 pm; R 10:30-11:30 am, or by appointment.

Course Catalog Number: 42074, Section 1 for undergraduate; 52074, Section 1 for graduate students
Registrar's Call Number: 20943 for undergraduates; 20944 for graduate students

Course Rationale and Objectives: Many basic and applied questions in the Earth Sciences require detailed knowledge of the sub-surface properties and spatial distribution of stratigraphic layers. Core and wireline logging methods are extremely useful in the fields of paleoclimate, hydrogeology, engineering geology, oil and gas exploration, and environmental remediation. Students in this class will learn the theory behind a range of methods. They will gain hands on experience using magnetic susceptibility and reflectance methods to address real-world logging problems. Examples from a variety of fields will be presented.

Text and other reading material:

For Graduate students:

Ellis, Darwin V., Singer, Julian M. "Well Logging for Earth Scientists" 2nd ed., 2007, XIX, 692 p. 450 illus., Hardcover ISBN: 978-1-4020-3738-2.
 (NOTE: This book is available to KSU students online through OhioLink).

For Undergraduate and Graduate

Rider, M. H., The Geological Interpretation of Well Logs, 2nd edition (4th printing; revised 2006), published by Rider-French Consulting Ltd. 280p., 2006, ISBN: 09541906-0-2.
 (NOTE: This book can be purchased directly from the publisher, Rider-French Consulting LTD online at their website: <http://www.riderfrench.co.uk/index.html?home.html>)

Reading will be assigned from the following sources, in addition to the open literature, and handouts:

Blum, P., 1997, Physical properties handbook: a guide to the shipboard measurement of physical properties of deep-sea cores. ODP Tech. Note, 26 [Online]. Available from World Wide Web: <<http://www-odp.tamu.edu/publications/tnotes/tn26/INDEX.HTM>>. [Cited 2004-08-13].

Available for Download: <http://www-odp.tamu.edu/publications/tnotes/tn26/INDEX.HTM>

CD-Rom Available from the instructor:

ODP Logging Manual, An Electronic Guide to ODP Logging Services, v2.0, Borehole Research Group, Lamont-Doherty Earth Observatory of Columbia University, 2000.

Online Information: The class website is: <http://www.personal.kent.edu/~jortiz/envlogging/>

To check your grades using your university email login name and password, login to flashline (<http://flashline.kent.edu>) and go to "My Courses", and select the link for Blackboard Vista.

Office Hours and Consultation with the Instructor: I want you to do well in this course! I welcome questions from all students either in person, by email, or by phone. Whether you are doing well in the course, find it challenging, or are on academic probation, attending office hours can help make the course a more enriching experience. To ensure your own privacy when sending electronic messages, please use your university email account. Include your first and last name on any electronic correspondence along with your banner id. Please do not use your social security number on any correspondence. Please cc a copy of any important messages that you send to the instructor back to yourself so that you have a record.

University Policies: The following University policies apply to anyone enrolled in this course:

1. **Enrollment Status:** The official registration deadline for this course is September 13, 2009. University policy requires all students to be officially registered in each class they are attending. Students who are not officially registered for a course by published deadlines should not be attending classes and will not receive credit or a grade for the course. Each student must confirm enrollment by checking his/her class schedule (using Student Tools in FlashFast) prior to the deadline indicated. Registration errors must be corrected prior to the deadline.
2. **Academic Honor Code:** All students in the course are expected to abide by the academic honor code, as specified in the University's "Digest of Rules and Regulations". The use of other's intellectual property without giving them appropriate credit is a serious academic offense. This includes misrepresenting the source, nature or other conditions of your academic work to get undeserved credit. It is the University's policy that cheating or plagiarism can result in receiving a failing grade for the work or course or other more serious disciplinary action. Repeat offenses can result in dismissal from the University.
3. **Drop and Withdrawal:** Withdrawal from any or all courses is permitted through the 10th week of the semester (or the prorated deadline for flexibly scheduled sections). After that time, students are considered to be committed to all remaining courses and must complete them. If students are unable to complete the semester because of extreme circumstances that first occur after the deadline, students should consult their college or campus dean's office. Any course withdrawal(s) processed after the second week of the semester will appear on the students' academic record with a grade of "W". Withdrawing from courses is permitted through Nov. 8, 2009. No approval is required to withdraw from a course during the withdrawal period. For more information see: <http://www.registrars.kent.edu/home/FALL/withdrawal.htm>.
4. **Students with Documented Accommodation needs:** In accordance with University policy, if you have a documented disability and require accommodations to obtain equal access to this course, please contact the instructor at the beginning of the semester or when given an assignment for which an accommodation is required. Students with disabilities must verify their eligibility through the Office of Student Accessibility Services (SAS) on the Ground Floor of the DeWeese Center (330-672-3391). If you have any questions regarding a potential accommodation need, please contact the instructor as soon as possible.
5. **Final Exam Dates:** Please check the final exam schedule for the classes in which you are enrolled. This can be found on the web at: <http://www.registrars.kent.edu/home/FALL/exams.htm>
In the event that you have a conflict with another scheduled exam, the instructor will make suitable arrangements. Students who have conflicts or more than three examinations on the same day should consult with the Dean of his or her college at the earliest possible time for assistance in making alternative arrangements. For more information see: <http://www.registrars.kent.edu/home/FALL/exams.htm>

Grading Policy: Students are expected to attend class, do the reading, and consult the web site throughout the term. These steps will help you to learn the material covered on the exams. There will also be several, in-class activities given during the term. They will allow you to gauge your progress and provide you with credit for class participation. Grades will be based on a subset of the assigned work as follows:

Undergraduates enrolled in the 40000-level section

Midterm exams (Two exams worth 15% each)	30%
Cumulative Final Exam	40%
Projects/Class Participation	30%
Total	100%

Graduate Student enrolled in the 50000-level section

Midterm exams (Two exams worth 15% each)	30%
Cumulative Final Exam	30%
Projects/Class Participation	15%
<u>Term Paper</u>	<u>25%</u>
Total	100%

Projects: Homework for the class will consist of readings and occasional data analysis projects. Students are encouraged to discuss the readings with others students in the class outside of the class meetings prior to the class session during which we will discuss the assigned reading. Problem sets should be completed independently unless otherwise instructed.

Term Papers: for graduate students enrolled in the 50000-level section, this course will require significant amounts of independent scholarship. Student will be expected to research a particular topic of interest on the syllabus, generate a bibliography of publications from the literature and complete a term paper on the subject. Students will be guided through this process during the term as they complete various stages of the project: (1) Bibliography of sources, (2) description of research question, (3) outline, (4) initial draft, (5) Final draft.

Exams: Each exam will consist of short answer and essay questions. Exams for graduate students will be longer than those for undergraduate. The questions may involve the interpretation of maps, diagrams, and graphs. The midterm exams will give students an opportunity to demonstrate their knowledge of the material presented. While the mid-term exams will be non-cumulative, the final exam will be cumulative. Exam scores may be curved at the discretion of the instructor, but each student has the potential to succeed in this course. Students are expected to pick up their graded exam papers in class when they are returned, or to make arrangements to do so at office hours.

Make-up Exams: Students who miss an exam must provide a written excuse in order to receive a make up assignment. Legitimate excuses include written documentation of the following: your own illness, a death in the family, military or official university athletic commitments. If you are involved in military or official university athletic activities, review the exam schedule at the beginning of the term and consult with the instructor prior to the exam if you have a conflict. If an illness, personal crisis, or family tragedy causes you to miss an exam, you must contact the instructor by phone or email no later than 48 hours after the scheduled start time of the exam. It is very important that you provide your full name, email address, and a telephone number where you can be reached in your phone or email message.

Text books on Geophysical Wireline Logging

You may find the following resources useful while take this class:

- Asquith G. and Gibson, C., Basic Well Log Analysis for Geologists, The American Association of Petroleum Geologists, Tulsa, OK, 216 p., 1982.
- Brock, J. Analyzing your logs, Fundamentals of Open Hole Log Interpretation, Volume I , Petro-Media, Inc., 1st ed., 1984.
- Crain, E.R., The Log Analysis Handbook, Quantitative Log Analysis Methods Series, vol. 1, PennWell Publishing, Tulsa, OK, 684 p., 1986.
- Halliburton Energy Services, NMR Logging Principles and Applications, Gulf Professional Publishing, 2001, ISBN-10: 0967902606, ISBN-13: 978-0967902609, 234 pages
- Hearst, J.R., Nelson, P.H. and F.L. Paillet, Well Logging for Physical Properties: A handbook for Geophysists, Geologists, and Engineers, 2nd Edition, John Wiley and Sons, New York, NY, 483 p., 1985.
- Johnson, D.E., and K.E. Pile, Well Logging for the Nontechnical Person, PennWell Publishing, Tulsa, OK, 198 p., 1988.
- Keys, W.S., Borehole Geophysics applied to Ground-Water Investigations, National Water Well Association, Dublin, OH, 313 p., 1989.
- Labo, J., A Practical Introduction to Borehole Geophysics: An Overview of Wireline Well Logging Principles for Geophysicists (Geophysical References, Vol. 2), Society of Exploration, 1987, ISBN-10: 0931830397, ISBN-13: 978-0931830396, 330 pages.
- Luthi, S., Geological Well Logs, Springer-Verlag New York, Inc; 1st edition, 2001, ISBN-10: 3540678409 ISBN-13: 978-3540678403, 373 pages.
- Repsold, H. Well Logging in Groundwater Development, International Contributions to Hydrogeology Series, vol. 9, Verlag Heinz Heise, Hannover, West Germany, 135 p., 1989.
- Rider, M. H., The Geological Interpretation of Well Logs, John Wiley, and sons, New York NY, 175 p., 1986.
- Rider, M. H., The Geological Interpretation of Well Logs, revised edition, Whittles Publishing, Caithness, England, 175 p., 1986. (?)
- Selley , R.C., Elements of Petroleum Geology, Academic Press; 2nd ed, 1997, ISBN-10: 0126363706, ISBN-13: 978-0126363708, 470 pages.
- Serra, Well Logging Data Acquisition and Applications, Technip Editions, 2004, ISBN-10: 2951561253, ISBN-13: 978-2951561250.
- Tang X.M. and Cheng, A., Quantitative Borehole Acoustic Methods, Volume 24 (Handbook of Geophysical Exploration: Seismic Exploration), Pergamon; 1 edition, 2004, ISBN-10: 0080440517, ISBN-13: 978-0080440514, 274 pages.

Environmental Core and Well Logging Fall 2009

Week	Date (MWF)	Lecture Title	Readings*	Assignment
1	8/31, 9/1, 9/4	Introduction to coring and well logging; The Logging Environment	Ellis and Singer Chapter 1 Rider M.H., The interpretation of Well logs, Chapters 1 and 2,	
2	9/9, 9/11 <i>(Labor Day: 9/7 no class)</i>	Selected tools from the Geophysical toolbox	Ellis and Singer Chapter 2 Rider M.H., The interpretation of Well logs, Chapters 1 and 2,	
3	9/14, 9/16, 9/18	Color Theory, VIS Spectroscopy, nIR Theory and applications	Reflectance Spectra by R. Clark (handout to be provided.)	Grads Select Term project
4	9/21, 9/23, 9/25	Electric Logging: Spontaneous Potential and Resistivity	Ellis and Singer Chapter 3, 4 Rider M.H., The interpretation of Well logs, Chapters 7	
5	9/28, 9/30, 10/2	Nuclear processes	Ellis and Singer Chapter 10 Rider M.H., The interpretation of Well logs, Chapters 7	Exam 1: 10/2
6	10/5, 10/7, 10/9	Active Gamma Methods (Gamma Density)	Ellis and Singer Chapter 12 Chi and Mienert Mar. Geo 131, 57-74, 1996. Bucker and Rybach, Mar. Pet. Geo., 13, 373-375, 1996.	Grads Term Project bibliography
7	10/12, 10/14, 10/16	Passive Gamma Methods (Natural Gamma Decay)	Ellis and Singer Chapter 11 Rider M.H., The interpretation of Well logs, Chapters 7	
8	10/19, 10/21, 10/23	Nuclear Magnetic Resonance	Ellis and Singer Chapter 16 Kenyon et al., Nuclear Magnetic Resonance Imaging- Technology for the 21st Century, Oilfield Review, 19-33, Autumn, 1995. Legchenko et al., J. App.Geophy., 50, 21-46, 2000.	Exam 2: 10/23
9	10/26, 10/28, 10/30	Neutron Porosity Logging	Ellis and Singer Chapter 13, 14	Grads Term Project Outline
10	11/2, 11/4, 11/6	Microresistivity	Ellis and Singer Chapter 5,6 Bonner et al., Resistivity while Drilling-Images from the string, Oilfield Review, 4-19, Spring 1996.	
11	11/9, 11/13 <i>(Vets day: 11/11 no class)</i>	MWD, LWD, and Offset Drilling	Ellis and Singer Chapter 6, 20	
12	11/16, 11/18, 11/20	Magnetic logging	Blum, ODP Physical properties Handbook, Chapter 4, Nov. 1997. Sun and Liu, EPSL 180, 287-296, 2000.	Grads Term Project First Draft
13	11/23, 11/27 <i>(Thksiving: 11/25 no class)</i>	Multi-sensor core logging	Weber et al., Mar Geo, 136, 151-172, 1997.	
14	11/30, 12/2, 12/4	Acoustic logging methods	Ellis and Singer Chapter 17 Rebesco et al., Sed. Geo. 135, 65-74, 2000.	
15	12/7, 12/9, 12/11	XRF Elemental Core logging	Richter et al., ODP SR 175 Chapter 13. Jansen and Dupont, ODP SR 175 Chapter 20.	Grads Term Project Final Version
16	12/16	Cumulative Final Exam	McGilvrey Hall Room 311 10:15 - 12:30 p.m. Wed. Dec. 16	Finals Week

* Additional readings from class handouts will also be required