

**Course Description and Syllabus**  
**GEOL 4/52074 Environmental Core and Well Logging**  
**Kent State University Department of Geology**  
**Spring 2012**  
**(<http://www.personal.kent.edu/~jortiz/envlogging/>)**

**Instructor:** Dr. Joseph D. Ortiz  
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**Lecture:** TR, 9:15-10:30 am, Room 307 McGilvrey Hall  
**Office Hours:** T: 10:30-11:30 pm; 3:30-5:00 pm W: 2:15-3:15 pm; R 10:30-11:30 pm, 3:30-5:00p,  
 or by appointment.

**Course Catalog Number:** 42074, Section 1 for undergraduate; 52074, Section 1 for graduate students  
**Registrar's Call Number:** 13731 for undergraduates; 13738 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 well 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.

**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.

**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., and Kennedy, M., The Geological Interpretation of Well Logs, 3rd edition, published by Rider-French Consulting Ltd. 432p., 2011, ISBN: 978-0-9541906-8-2.

(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>)

Depending on the pace of the class, additional reading may 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 (Must be returned):

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

**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. Following university policy and to ensure your own privacy when sending electronic messages, please use your university email account for all correspondence related to this class. Include your first and last name on any electronic 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. University Calendar:** The official university calendar, which provides information on deadlines for university-related transactions can be found at: [http://www.kent.edu/registrar/calendars/stu\\_spring.cfm](http://www.kent.edu/registrar/calendars/stu_spring.cfm).
- 2. Enrollment Status:** Students are responsible for ensuring that they are properly enrolled in their classes. The official registration deadline for this course is January 22, 2012 (see the university calendar for late registration deadlines and late fee information, etc.). You are advised to review your official class schedule during the first two weeks of the semester and prior to the drop and withdrawal dates to ensure that you are properly enrolled in this class and section. 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.
- 3. Academic Honor Code:** All students in the course are expected to abide by the academic honor code, as specified in the University's Policy Register. The use of other's intellectual property without giving them appropriate credit is a serious academic offense. This includes copying answers, misrepresenting the source, nature or other conditions of your academic work to get undeserved credit. At a minimum, students caught cheating during exams will receive a midterm grade of zero which will count for 50% of their overall average midterm score, and the incident will be reported to the university. It is the University's policy that cheating or plagiarism can result in receiving a failing grade for the course or other more serious disciplinary action depending on the nature of the offense. Repeat offenses can result in dismissal from the University. For complete information see the Kent State University Policy Register, Chap. 3, section 3-01-8
- 4. Withdrawal:** For Spring term, the last day to drop a class before a grade of W is applied is January 22, 2012. Withdrawal from any or all courses is permitted up to the withdrawal date for the semester, or until the prorated deadline for flexibly scheduled sections. For the Spring term the deadline to withdraw with a grade of W entered on your transcript is March 18, 2012. 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. No approval is required to withdraw from a course during the withdrawal period. For more information see: [http://www.kent.edu/registrar/calendars/stu\\_spring.cfm](http://www.kent.edu/registrar/calendars/stu_spring.cfm).
- 5. Students with Documented Accommodation needs:** Students who require health-related accommodations must verify their eligibility through the Office of Student Accessibility Services (SAS) on the Ground Floor of the DeWeese Health Center (330-672-3391 or <http://www.kent.edu/sas>). In accordance with University policy, if you have a documented need for a health-related accommodation 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. If you have any questions regarding a potential accommodation need, please contact the instructor and SAS as soon as possible.

**6. 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.kent.edu/registrar/calendars/spring\\_finalsch.cfm](http://www.kent.edu/registrar/calendars/spring_finalsch.cfm). In the event that you have two exams scheduled at the same time, 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.

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

Undergraduates enrolled in the 40000-level section		Graduate Students enrolled in the 50000-level section	
Mid-term Exams (two worth 15% each)	30%	Mid-term Exams (two worth 15% each)	30%
Cumulative Final Exam	40%	Cumulative Final Exam	30%
Class Projects/Class Participation	30%	Class Projects/Class Participation	15%
		Term Project	25%
<b>Total</b>	<b>100%</b>	<b>Total</b>	<b>100%</b>

**Class Projects:** Projects for the class will consist of readings and research 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. Research projects should be completed by the groups assigned in class.

**Term Project:** 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:** The exam 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 are expected to manage their academic and personal activities responsibly during the term. Students who miss an exam must provide a written documentation in a timely manner in order to receive a make-up exam. Legitimate excuses for missing an exam include written documentation for the following: conflict with another Kent State University academic activity (such as an on or off campus field trip), your own illness, a death in the family, and military or intercollegiate 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 you have an illness, personal crisis or family tragedy that results in missing 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 name 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.

## Spring 2012 Environmental Core and Well Logging Class Schedule and Assignments

Week	Date (TR)	Lecture Number and Title	Readings	Assignment
1	Jan 10, 12	Introduction to coring and well logging; The Logging Environment	Ellis and Singer Chapter 1 Rider & Kennedy, Chapters 1 and 2 <b>Selected tools from the Geophysical toolbox</b>	
2	Jan 17, 19	Logging Methods overview Thermcon & Caliper logging	Ellis and Singer Chapter 2 Rider & Kennedy, Chapters 4 and 5 <b>Selected tools from the Geophysical toolbox</b>	
3	Jan 24, 26	Electric Logging: Spontaneous Potential and Resistivity	Ellis and Singer Chapter 3, 4 Rider & Kennedy, Chapters 6 and 7	<b>Grads Select Term project</b>
4	Jan 31, Feb 2	Microresistivity	Ellis and Singer Chapter 5, 6 Rider & Kennedy, Chapters 7, 15 Bonner et al., Resistivity while Drilling- Images from the string, Oilfield Review, 4-19, Spring 1996.	
5	Feb 7, 9	Color Theory, Visible (VIS) reflectance derivative spectroscopy, Near Infrared (nIR) Theory and applications	Reflectance Spectra by R. Clark (urls or handout to be provided.) <b>Color Theory</b>	<b>Exam 1: Feb 9</b>
6	Feb 14, 16	Nuclear processes	Ellis and Singer Chapter 10 Rider & Kennedy, Chapters 8.1-8.3	<b>Grads Term Project bibliography</b>
7	Feb 21, 23	Active Gamma Methods (Gamma Density and Photoelectric effect)	Ellis and Singer Chapter 12 Rider & Kennedy, Chapters 10 Chi and Mienert Mar. Geo 131, 57-74, 1996. Bucker and Rybach, Mar. Pet. Geo., 13, 373-375, 1996.	
8	Feb 28, Mar 1	Passive Gamma Methods (Total Natural Gamma and Spectral Natural Gamma)	Ellis and Singer Chapter 11 Rider & Kennedy, Chapter 8	<b>Exam 2: Mar 1</b>
9	Mar 6, 8	Nuclear Magnetic Resonance	Ellis and Singer Chapter 16 Rider & Kennedy, Chapters 13 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.	
10	Mar 13, 15	Neutron Porosity Logging	Ellis and Singer Chapter 13, 14 Rider & Kennedy, Chapters 11	<b>Grads Term Project Outline</b>
	Mar 19-25	<b><i>No Classes; Spring Break</i></b>		
11	Mar 27, 29	Sonic or Acoustic logging methods	Ellis and Singer Chapter 17 Rider & Kennedy, Chapters 9 Rebesco et al., Sed. Geo. 135, 65-74, 2000.	
12	Apr 3, 5	Magnetic logging	Blum, ODP Physical properties Handbook, Chapter 4, Nov. 1997. Sun and Liu, EPSL 180, 287-296, 2000.	<b>Grads Term Project First Draft</b>
13	Apr 10, 12	XRF Elemental Core logging	Richter et al., ODP SR 175 Chapter 13. Jansen and Dupont, ODP SR 175 Chapter 20.	
14	Apr 17, 19	Multi-sensor core logging	Weber et al., Mar Geo, 136, 151-172, 1997.	
15	Apr 24, 26	MWD, LWD, and Formation evaluation	Ellis and Singer Chapter 6, 20 Rider & Kennedy, Section 9.4, 15.3, Chapters 12, 16	<b>Grads Term Project Final Version</b>
<b><i>End of class sessions</i></b>				
16 Finals Week	May 3	<b>Cumulative Final Exam</b> <b>McGilvrey Hall Room 307</b>  <b>7:45 - 10:00 am Thursday May 3rd, 2012</b>		