NEW COURSE FORM

Signature Routing Log

General Information:

Course Prefix and Number: GLY 185

Proposal Contact Person Name: J. Richard Bowersox Phone: 323-0536 Email: jrbowe3@uky.edu

INSTRUCTIONS:

Identify the groups or individuals reviewing the proposal; note the date of approval; offer a contact person for each entry; and obtain signature of person authorized to report approval.

Internal College Approvals and Course Cross-listing Approvals:

Reviewing Group	Date Approved	Contact Person (name/phone/email)	Signature
Earth & Envirn. Sci., DUS	9/2/10	David Moecher / 7-6939 / moker@uky.edu	
Earth & Envirn. Sci., Chair	9/2/10	D. Ravat / 7-3758 / dhananjay.ravat@uky.edu	D. Ravat
	/ /		
A&S Ed. Policy Cmte.	9/21/10	G. Murthy / 7-4729 / ganpathy.murthy@uky.edu	
A&S Dean's Office	9/21/10	Anna Bosch / 7-6689 / bosch@uky.edu	

External-to-College Approvals:

Council	Date Approved	Signature	Approval of Revision[6]
Undergraduate Council	4/12/2011	Sharon Gill Digitally signed by Sharon Gill DN: cn=Sharon Gill, o=Undergraduate Education, ou=Undergraduate Council, email=sgill@uky.edu, c=US Date: 2011.04.19 08:11:37 -04'00'	
Graduate Council			
Health Care Colleges Council			
Senate Council Approval		University Senate Approval	

Comments:

[6] Councils use this space to indicate approval of revisions made subsequent to that council's approval, if deemed necessary by the revising council.

NEW COURSE FORM

1. General Information.

a. Submitted by the College of: Arts and Sciences Today's Date: 09-02-10

b. Department/Division: Earth and Environmental Sciences

c. Contact person name: J. Richard Bowersox Email: jrbowe3@uky.edu Phone: 323-0536

d. Requested Effective Date: ☐ Semester following approval OR ☒ Specific Term/Year[1]: Fall 2011

2. Designation and Description of Proposed Course.

a. Prefix and Number: GLY 185

b. Full Title: Quantifying the Bluegrass Water Supply

c. Transcript Title (if full title is more than 40 characters): Quantifying the Bluegrass Water Supply

d. To be Cross-Listed[2] with (Prefix and Number): _____

e. Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours[3] for each meeting pattern type.

2 Lecture _____ Laboratory[1] 1 Recitation _____ Discussion _____ Indep. Study

_____ Clinical _____ Colloquium _____ Practicum _____ Research _____ Residency

_____ Seminar _____ Studio _____ Other – Please explain: _____

f. Identify a grading system: ☒ Letter (A, B, C, etc.) ☐ Pass/Fail

g. Number of credits: 3

h. Is this course repeatable for additional credit? YES ☐ NO ☒

If YES: Maximum number of credit hours: _____

If YES: Will this course allow multiple registrations during the same semester? YES ☐ NO ☐

i. Course Description for Bulletin: This course develops the ability to locate and identify data, critically evaluate the data, develop probabilistic models, and present the results of their research. Geology provides important information on the origins of natural resources and the amounts available for exploitation and use. Course focuses on the issues surrounding the water supply and demand in the central Kentucky Bluegrass region, and the impact of global climate change.

j. Prerequisites, if any: None

k. Will this course also be offered through Distance Learning? YES[4] ☐ NO ☒

l. Supplementary teaching component, if any: ☐ Community-Based Experience ☐ Service Learning ☐ Both

3. Will this course be taught off campus? YES ☐ NO ☒

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[1] Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.

[2] The chair of the cross-listing department must sign off on the Signature Routing Log.

[3] In general, undergraduate courses are developed on the principle that one semester hour of credit represents one hour of classroom meeting per week for a semester, exclusive of any laboratory meeting. Laboratory meeting, generally, represents at least two hours per week for a semester for one credit hour. (from *SR 5.2.1*)

[4] You must *also* submit the Distance Learning Form in order for the proposed course to be considered for DL delivery.

NEW COURSE FORM

4. **Frequency of Course Offering.**

   a. Course will be offered (check all that apply): ☒ Fall ☒ Spring ☒ Summer

   b. Will the course be offered every year? YES ☒ NO ☐

   If NO, explain: _____

5. **Are facilities and personnel necessary for the proposed new course available?** YES ☒ NO ☐

   If NO, explain: _____

6. **What enrollment (per section per semester) may reasonably be expected?** 100

7. **Anticipated Student Demand.**

   a. Will this course serve students primarily within the degree program? YES ☐ NO ☒

   b. Will it be of interest to a significant number of students outside the degree pgm? YES ☒ NO ☐

   If YES, explain: This course will fulfill the general education requirement in quantitative reasoning

8. **Check the category most applicable to this course:**

   ☐ Traditional – Offered in Corresponding Departments at Universities Elsewhere

   ☐ Relatively New – Now Being Widely Established

   ☒ Not Yet Found in Many (or Any) Other Universities

9. **Course Relationship to Program(s).**

   a. Is this course part of a proposed new program? YES ☐ NO ☒

   If YES, name the proposed new program: _____

   b. Will this course be a new requirement[5] for ANY program? YES ☐ NO ☒

   If YES[5], list affected programs: _____

10. **Information to be Placed on Syllabus.**

   a. Is the course 400G or 500? YES ☐ NO ☒

   If YES, the *differentiation for undergraduate and graduate students must be included* in the information required in ***10.b***. You must include: (i) identification of additional assignments by the graduate students; and/or (ii) establishment of different grading criteria in the course for graduate students. (See *SR 3.1.4.*)

   b. ☐ The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if applicable, from ***10.a*** above) are attached.

[5] In order to change a program, a program change form must also be submitted.

University Senate Syllabi Guidelines

General Course Information

- ☐ Full and accurate title of the course.
- ☐ Departmental and college prefix.
- ☐ Course prefix, number and section number.
- ☐ Scheduled meeting day(s), time and place.

Instructor Contact Information (if specific details are unknown, "TBA" is acceptable for one or more fields)

- ☐ Instructor name.
- ☐ Contact information for teaching/graduate assistant, etc.
- ☐ Preferred method for reaching instructor.
- ☐ Office phone number.
- ☐ Office address.
- ☐ UK email address.
- ☐ Times of regularly scheduled office hours and if prior appointment is required.

Course Description

- ☐ Reasonably detailed overview of the course.
- ☐ Student learning outcomes.
- ☐ Course goals/objectives.
- ☐ Required materials (textbook, lab materials, etc.).
- ☐ Outline of the content, which must conform to the Bulletin description.
- ☐ Summary description of the components that contribute to the determination of course grade.
- ☐ Tentative course schedule that clarifies topics, specifies assignment due dates, examination date(s).
- ☐ Final examination information: date, time, duration and location.
- ☐ For 100-, 200-, 300-, 400-, 400G- and 500-level courses, numerical grading scale and relationship to letter grades for *undergraduate* students.
- ☐ For 400G-, 500-, 600- and 700-level courses, numerical grading scale and relationship to letter grades for *graduate* students. (Graduate students cannot receive a "D" grade.)
- ☐ Relative value given to each activity in the calculation of course grades (Midterm=30%; Term Project=20%, etc.).
- ☐ Note that undergraduate students will be provided with a Midterm Evaluation (by the midterm date) of course performance based on criteria in syllabus.
- ☐ Policy on academic accommodations due to disability. Standard language is below:

  > If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

Course Policies

- ☐ Attendance.
- ☐ Excused absences.
- ☐ Make-up opportunities.
- ☐ Verification of absences.
- ☐ Submission of assignments.
- ☐ Academic integrity, cheating & plagiarism.
- ☐ Classroom behavior, decorum and civility.
- ☐ Professional preparations.
- ☐ Group work & student collaboration.

University of Kentucky
Department of Earth and Environmental Sciences

GLY 185: Quantifying the Bluegrass Water Supply
An Introductory Course in Quantitative Reasoning

Course Information
Course Hours: Lectures: Monday–Wednesday
Recitation Sections (Connections): Friday
Classroom: tba

Textbook:
There is no text assigned for this course. You will be provided with links to online material or a handout posted to Blackboard before each class session. This should lead you to explore the universe of other online resources during the semester to enhance your understanding of the material, or bring up questions for further discussion in class or in the recitation sections. Software we will use this semester is available to you as free downloads for work outside of class.

Blackboard:
I use Blackboard for announcements, course content, and posting grades. It is your responsibility to keep up with Blackboard content.

Overview:
This is a pilot course in the earth sciences that explores the quantitative foundations of the natural world. This course is part of the university's new general education program in the quantitative foundations category. The goal of this course is for you to develop the ability to locate and identify information, critically evaluate the information, and present the results of your research. Geology provides important information on the origins of natural resources and the amounts available for exploitation and use. This course will introduce you to the quantitative foundations of the natural world illustrated by the water supply and demand in Kentucky. The methods we will use include tables, charts, graphs and maps, along with some statistical methods to validate and analyze data. Our tools will be the *Microsoft Office* suite and *Google Earth* software.

Course Topics:
Course topics are divided into three modules, each with its own goals and outcomes:

I **"We need information, Number Six!"** (ten class and recitation sessions, with Exam #1 on September 23; 30% of the course). This module introduces the concepts of:

- Information and data;
- Independent, continuous, and time series data;
- Data sources and credibility;
- Descriptive statistical tests of data quality, relationships, and probabilities; and,
- Data presentation in tables, charts, graphs, and maps including GIS and contour maps.

Assessments will include in-class exercises, homework assignments, and an exam at the conclusion of the module where the students will demonstrate their proficiency with the material.

II **"By the rivers of Babylon..."** (13 class and recitation sessions, with Exam #2 on October 28; 40% of the course). The concepts introduced in this module are:

- Describing the Earth's surface and surface data through maps;
- Estimating the size of a river's drainage basins using GIS methods;
- Measurement of water supply from precipitation and runoff data;
- Estimating probability and magnitude of floods along the Kentucky River; and,
- Summarizing the Kentucky River supply in charts, graphs, and maps

In this module you will learn and practice more advanced techniques in descriptive statistics, probability, and GIS presentation. Census data and demographics will be introduced early in this module in an exercise using Google Earth for presenting GIS data.

III **"Water, water, everywhere, nor any drop to drink."**: (ten class and recitation sessions, with Exam #3 on November 30; 30% of the course). In the final course module you will model the sustainability of Kentucky and Lexington water supply from sources, population demographics, and considering climate change. The final product of this module, and the course, is a written report describing your model, its graphical product, and its results. For this you will consider:

- Water supply history of the Kentucky River;
- Population demographics and water demand for the Kentucky River basin;
- Evaluation of climate change models and their forecasts for the Kentucky;
- Assessing and compiling data necessary for their models;
- Developing their water supply and demographic models in Excel;
- Developing a probabilistic forecast of water supply and demand in Excel; and
- Preparing and submitting a written report synthesizing their research.

In this module you will complete your research into the Kentucky River water supply and demand, demographics of the Kentucky River basin, assess climate models, and be introduced to scientific writing. You will prepare models for hydrologic and demographic data, then prepare a probabilistic forecast for water supply and demand in the Kentucky River basin that incorporates climate change models. Your term project (below) will be completed during this module. Assessments will include in-class exercises, homework assignments, and an exam at the conclusion of the module where the students will demonstrate their proficiency with the material.

This course is progressive in that outcomes of the first two modules are the skills you will apply to complete the third module. But more than the "how?" of techniques, you will learn the "what and why?" and that it is ok to ask, "How do you know?" and, "Why not?" That is, evaluate, interpret, and challenge data and models of all kinds.

Attendance

It is your responsibility to attend classes. There may exercises that are completed during lectures that you must be present to complete or have a valid excused absence for makeup. Attendance of recitation sessions is a course requirement. Make-up of a recitation exercise, again, will only be possible with for an excused absence. Missing a recitation session also means you miss out on all of the discussion for that session, which can be a valuable source of insight into a topic.

When is it ok to skip classes? From my perspective, other than excused absences as outlined below, never. Realistically, there may be times when you need to miss a class. Please contact me in advance in case there are quizzes or assignments given or due on the day you will miss. Otherwise, refer to these *Lifehacker* posts for some advice:

- *lifehacker.com/5334130/learn-when-its-okay-to-skip-class*
- *lifehacker.com/5335215/10-must+dos-for-the-first-week-of-college*

Grading

Overall grade components:

Homework	15%
Recitations	20%
Three Exams (total)	15%
Final Exam	25%
Final Report	25%

Grades will be calculated from the weighted percent score earned during the semester of each component. Overall grading:

90% and above	A
80-89%	B
70-79%	C
60-69%	D
Below 60%	E

Final course grades may be determined using a grading curve, at my discretion. I do not curve any scores prior to calculating final course grades. Midterm grades are reported and at-risk students identified.

Submitting Completed Assignments

Completed assignments are due at the beginning of class on the assigned due date. Late assignments submitted by 1:00 PM the following day to my mailbox (SRB 101) will receive a 10% penalty. Assignments received between 1:00 PM the day following the due date and 1:00 PM on the 2nd day following the due date will receive a 20% penalty. Assignments will not be accepted after 1:00 PM on the second day without a verifiable written excuse specifically recognized by the University. Makeup of missed assignments, quizzes, and exams is only permitted in cases of excused absence with written verification for official activities and student athletes, illness of the student or of an immediate family member, family death, or incarceration with citation. The Dean of Students (859-257-3754) can assist if you need written verification for missing a class. Students missing work due to an excused absence bear the responsibility of informing me about their excused absence within one week following the period of the excused absence (except where prior notification is required), and of making up the missed work.

Written Assignments
As a general rule, no written assignment may be submitted by email attachment. You will be completing some assignments that may include questions on printed worksheets. These worksheets must be completed hand-written. It is important that written assignments be completed as instructed: do not read anything more into instructions than what is given. If you find my instructions to be vague, please contact me for clarification. You will be given as much credit as possible for your written assignments, but in the end it is my sole judgment as to whether or not you have correctly completed any portion of an assignment.

Term Project
The final product of this course, is an evidence-based written report discussing the your model and forecast of water supply and demand in the Kentucky River basin based on the data compiled and analyzed during the term, and supported by its tabular and graphical content. Content, style, and formatting of your report will be covered in class sessions and recitation sessions during the third course module.

Exams
Exams may include any combination of multiple choice, matching, short answer, fill-in, and true/false questions. You may be required to use and interpret tables, graphs, maps, or diagrams, and perform calculations. Additional details will be provided to you in a review session before each exam. All material presented in lecture and recitation, readings, and homework assignments should be reviewed in preparation for exams. Most of the lecture notes will be related to the readings, although supplemental material not in the readings may also be presented in class. It is important that you come to exams prepared, meaning that you have #2 pencils and eraser and a calculator.

IF YOU MISS AN EXAM it is your responsibility to contact me no later than the day after the exam! Email me (preferably) or call my office and leave a message, including a working phone number where you can be reached. If you have a scheduling conflict with an exam for an officially sanctioned University reason, you may arrange to take the exam at a different time or date. However, you must inform me as soon as possible (no later than one week before the exam). Make-up exams will only be given with excused absences as stated above. Written proof must be provided in all cases. Make-up exams may be in essay format.

Final Exam
The final exam will be comprehensive, and cover all material presented in class. *See me if you have more than two final exams on the day of our final.* If the final exam is missed for a legitimate excuse, as outlined above, and not made up before I am required to submit grades to the Registrar, an Incomplete course grade will be entered for you and the final exam must be completed by the end of the next semester.

Extra Credit
You will have the opportunity to earn up to a total of 10 extra credit points by doing the following: Find up to five different news articles covering water issues in Kentucky. Each article will be worth one point. Up to one additional point can be earned for each article by writing a brief summary of the article (one page or less). These can be submitted at any time during the semester before dead week. Extra credit points will be added to your total for the three exams.

Disability Accommodations

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center, located at 2 Alumni Gym, telephone (859) 257–2754, email address jkarnes@eamil.uky.edu) for coordination of campus disability services available to students with disabilities.

Academic Integrity

I encourage you to work together and study together for exams. However, all assignments, projects, and exercises completed by students for this class should be the product of the personal efforts of the individual(s) whose name(s) appear on the corresponding assignment. Misrepresenting others' work as one's own in the form of cheating or plagiarism is unethical and will lead to those penalties outlined in the University Senate Rules (6.3.1 & 6.3.2) at *www.uky.edu/USC/New/rules_regulations/index.htm*. The Ombud site also has information on plagiarism found at *www.uky.edu/Ombud*. Do not copy or read what another classmate has written. In addition, direct copying of information and phrases from Internet sites and other sources constitutes plagiarism. Submit your own work in your own words! Any sources used for written assignments must be properly documented. See the UK *Student Rights and Responsibilities* handbook for a discussion of cheating and plagiarism if you have questions. As students and faculty in the University of Kentucky, we are all responsible for adhering to these policies.

Classroom Civility and Decorum

The university, college and department has a commitment to respect the dignity of all and to value differences among members of our academic community. There exists the role of discussion and debate in academic discovery and the right of all to respectfully disagree from time-to-time. Students clearly have the right to take reasoned exception and to voice opinions contrary to those offered by the instructor and/or other students (S.R. 6.1.2). Equally, a faculty member has the right -- and the responsibility -- to ensure that all academic discourse occurs in a context characterized by respect and civility. Obviously, the accepted level of civility would not include attacks of a personal nature or statements denigrating another on the basis of race, sex, religion, sexual orientation, age, national/regional origin or other such irrelevant factors.

FERPA

The *Family Educational Rights and Privacy Act of 1974* (**FERPA**, or the Buckley Amendment) is a United States federal law codified at 20 U.S.C. § 1232g, with implementing regulations in Title 34, Part 99 of the Code of Federal Regulations. The regulations provide that educational agencies and institutions that receive funding under a program administered by the U. S. Department of Education must provide students with access to their education records, an opportunity to seek to have the records amended, and some control over the disclosure of information from the records. With several exceptions, schools must have a student's consent prior to the disclosure of education records.

From: *en.wikipedia.org/wiki/Family_Educational_Rights_and_Privacy_Act*.

What this means is that I cannot post grades to any public area, return papers other than handing them to the you directly, or discuss any aspect of your performance in class with another person outside of the university administration without your consent. If you want your graded assignments returned to you, you will need to come to my office or my TAs office.

Electronic Devices

With the exception of tape or other similar audio recording devices and calculators, or as permitted as a disability accommodation, the use of a cell phone, music player, or similar electronic devices is not permitted in class. Cell phones must be put away during class. Texting during class is both distracting to me and disrespectful of your classmates.

Copyright

All material presented in class is covered by copyright. Lecture notes or any other material that is part of this course, including but not limited to any material posted to Blackboard, exams, quizzes, or assignments of any kind, and audio recordings of lectures are not permitted for sale.

10 Tips to Performing Well in GLY 185

1. Read chapters before class and review notes.
2. Come to every class, be on time, and stay for the entire period. Early departures are disruptive to the class.
3. Please, **TURN OFF YOUR CELL PHONES!**
4. Pay attention during the lectures and ask questions (in class, after class, during office hours, or via e-mail). A fair question to ask about any topic is, "How do you know?"
5. Take good notes. Lecture slideshow handouts for the topic to be covered will be posted to Blackboard no later than 4 PM of the day of the lecture. These handouts are for your benefit – use them as a guide for taking notes during the lecture, NOT as a substitute for attending class.
6. Know what the terms mean. Every science has a vocabulary of its own and, while I will try to keep the terms to a minimum, you need to be able to speak and understand the language to some extent.
7. Find someone to study with who is committed to doing as well in the class as you are.
8. Read newspapers or the news online or listen to the news on the radio, TV, or podcasts.
9. Get started on your homework and written assignments early. Web site problems and computer problems commonly occur when you leave assignments until the last minute!
10. I cannot provide computer tech support to you. Any assignment I post, any website I send you to, or any streaming video you need to watch, was working for me when I made the assignment. Computer and printer problems are not an excuse for turning in a late assignment. If you are have problems with your computer, or accessing a website, contact IT tech support at 859-257-1300, or visit their website at *www.uky.edu/UKIT/*. Please be aware that there is limited support, if any, for Macs on campus so let this guide your purchase or upgrade of computer hardware.

Computer Software and Hardware

UK has a great program for providing free or deeply discounted computer software and hardware to its students, faculty, and staff. You can download Microsoft Office Professional, Windows operating systems, virus scanners, and other supported software at *download.uky.edu/*. Discounted software and hardware can be purchased through *www.uky.edu/UKIT/purchase.htm*.

Contacting Me

The best way to contact me is by email through Blackboard. Please do not email me from Hotmail, Gmail, Yahoo, or any service outside of your UK account. Outlook tends to interpret email form these services as spam, which goes directly to a spam folder and gets deleted daily. It is unlikely I will receive your message from any of these services. Likewise, a blank subject line may be interpreted as a spam message and deleted. Please include the course number in your message if you are not sending from your UK account but not through Blackboard.

GLY 185 Schedule of Topics and Evaluations: Fall 2011

Week	Date	Module	Topic	No.	Exercise
1	24-Aug		Syllabus and course introduction	—	Introduce software: Excel, Google Earth
	26-Aug		Connections	1.1	The water cycle
2	29-Aug		Data and Information; The absence of data and "zero" data points	1.2	Independent versus gradient data; time-series data
	31-Aug	Module 1: "We need information, Number 6!": Information and data; data acquisition, preparation, redution, and display; obtaining information from data through statistics.	What kinds of water data do we have?	1.3	USGS water data
	02-Sep		Connections	1.4	Going with the flow: making hydrographs
3	05-Sep		**Labor Day Holiday**		**No class**
	07-Sep		Now what? Descriptive statistics	1.5	Mean, median, mode; binning
	09-Sep		Connections	1.6	Statistics? Are you kidding?
4	12-Sep		Some other useful statistics: Inferential statistics	1.7	Ranking data and probabilities
	14-Sep		Contouring gradient data	1.8	Contour maps
	16-Sep		Connections	1.9	Don't need no GPS: making a contour map
5	19-Sep		Data in three dimensions: topographic maps	1.10	Topographic maps
	21-Sep		Module Review	30%	Exam #1 Review
	23-Sep		Module Evaluation		Exam #1
6	26-Sep		Cartesian coordinates: x and y directions	2.1	Describing the Earth's surface and data with maps: location – egsc.usgs.gov/isb/pubs/teachers-packets/exploringmaps/location.pdf
	28-Sep		Adding the third dimension: the z dimension	2.2	The form of the Earth described with maps
	30-Sep		Connections	2.3	Introduction to Google Earth: Where do people live? Fayette County census map (gecensus.stanford.edu/gcensus/index.htm)
7	03-Oct		Where does the water in the Kentucky River come from?	2.4	The water cycle: a redux emphasizing Kentucky
	05-Oct		Estimating the size of stream drainage basins	2.5	What is a drainage basin, anyway?
	07-Oct	Module 2: "By the rivers of Babylon...": Describing the Earth's surface with maps, surface water and supply, the Kentucky River system from headwaters to th eOhio River, and floods along the Kentucky River	Connections	2.6	Estimating surface areas with Google Earth
8	10-Oct		Where does the water in the Kentucky River come from?	2.7	Estimating the magnitude of river system discharge by drainage basin area, precipitation, and stream hydrographs
	12-Oct		Where does the Kentucky River go?	2.8	Flow along the Kentucky River to its discharge into the Ohio River at Carrollton
	14-Oct		Connections	2.9	Plotting annual water flow in the Kentucky River from its headwaters to the Ohio River with GIS
9	17-Oct		Water use along the Kentucky River	2.10	Who gets how much water?
	19-Oct		Floods along the Kentucky River	2.11	Too little, too much, and how much is enough?
	21-Oct		Connections	2.12	Predicting floods along the Kentucky River
10	24-Oct		Summary of the Kentucky River water supply	2.13	Calculating flood probability and magnitude
	26-Oct		Module Review	40%	Exam #2 Review
	28-Oct		Module Evaluation		Exam #2
11	31-Oct		The past is the key to the future	3.1	History of Kentucky River supply
	02-Nov		Where people come into the picture	3.2	Demographics of the Bluegrass region from census data
	04-Nov	Module 3: "Water, water, everywhere, nor any drop to drink.": Modeling sustainability of Kentucky and Lexington water supply from sources, population demographics, and climate change.	Connections	3.3	Kentucky census data and mapping
12	07-Nov		Global climate change and Kentucky	3.4	How global climate change affects the Bluegrass Region
	09-Nov		Constructing models	3.5	Assessing and compiling the necessary data
	11-Nov		Connections	3.6	Constructing models in Excel
13	14-Nov		Issues in models	3.7	Avoiding "garbage in, garbage out."
	16-Nov		Evaluating models	3.8	Do your conclusions make sense?
	18-Nov		Connections	3.9	Writing for Science
14	21-Nov		What all of this means to us	3.10	Reports due
	23-Nov		**Thanksgiving Holiday**		**No class**
	25-Nov		**Thanksgiving Holiday**		**No class**
15	28-Nov		Module Review	30%	Exam #3 Review
	30-Nov		Module Evaluation		Exam #3
	02-Dec		Connections		Recitation: Final Insights
16	05-Dec		Module 1 Review		Final Exam Review #1
	07-Dec		Module 2 Review		Final Exam Review #2
	09-Dec		Module 3 Review		Final Exam Review #3
17	tba		Final Exam		

GLY 185 Readings and Homework: Fall 2011

Week	Date	No.	Reading for the Next Class	No.	Homework
1	24-Aug	—	ga.water.usgs.gov/edu/watercyclesummary.html	—	Article about water
	26-Aug	1.1	en.wikipedia.org/wiki/Data	1.1	Examples of independent and gradient data
2	29-Aug	1.2	pubs.usgs.gov/fs/2005/3131/FS2005-3131.pdf	1.2	nwis.waterdata.usgs.gov/tutorial/
	31-Aug	1.3	nwis.waterdata.usgs.gov/tutorial/realtime_streamflow.html	1.3	USGS surface water data: Kentucky River Lock 7, Highbridge, KY
	02-Sep	1.4	mste.illinois.edu/hill/dstat/dstat.html	1.4	Exercise on descriptive statistics using water data
3	05-Sep				
	07-Sep	1.5		1.5	
	09-Sep	1.6	faculty.vassar.edu/lowry/webtext.html	1.6	
4	12-Sep	1.7	en.wikipedia.org/wiki/Contour_line	1.7	Handout exercise on contouring
	14-Sep	1.8	academic.brooklyn.cuny.edu/geology/leveson/core/linksa/elevation.html	1.8	Handout on topographic maps and contouring
	16-Sep	1.9	egsc.usgs.gov/isb/pubs/booklets/topo/topo.html#Map	1.9	Distance between points: www.movable-type.co.uk/scripts/latlong.html
5	19-Sep	1.10		1.10	
	21-Sep				
	23-Sep				
6	26-Sep	2.1	egsc.usgs.gov/isb/pubs/teachers-packets/exploringmaps/teacher.pdf	2.1	Activity 1: egsc.usgs.gov/isb/pubs/teachers-packets/exploringmaps/exploration.pdf
	28-Sep	2.2	earth.google.com/support/bin/static.py?page=guide_toc.cs	2.2	gecensus.stanford.edu/gcensus/index.html
	30-Sep	2.3	River Basins of Kentucky – kgs.uky.edu/kgsweb/olops/pub/kgs/mc102_12.pdf	2.3	Video: Earth Revealed #19, *Running Water* *www.learner.org/resources/series78.html?pop=yes&pid=330*
7	03-Oct	2.4	The Kentucky River Basin map – kgs.uky.edu/kgsweb/olops/pub/kgs/mc188_12.pdf	2.4	Kentucky River profile from Whitesburg, Lechter County, to Lock 2 in Henry County: USGS Water-Data Report KY-05-1, p. 188-271
	05-Oct	2.5	The Kentucky River Basin map – kgs.uky.edu/kgsweb/olops/pub/kgs/mc188_12.pdf	2.5	Drainage basins of the Kentucky River system: USGS Water-Data Report KY-05-1, p. 188-271
	07-Oct	2.6	earth.google.com/support/bin/static.py?page=guide_toc.cs	2.6	USGS Water-Data Report KY-05-1, p. 188-271
8	10-Oct	2.7	USGS Water-Data Report KY-05-1, p. 188-271 wdr.water.usgs.gov/wy2009/pdfs/03287500.2009.pdf	2.7	Streamflow: waterwatch.usgs.gov/?m=flood&r=ky&w=real,table Precipitation: hdsc.nws.noaa.gov/hdsc/pfds/orb/ky_pfds.html mcc.sws.uiuc.edu/climate_midwest/mwclimate_data_summaries.htm#
	12-Oct	2.8	waterwatch.usgs.gov/?m=flood&r=ky&w=real,table www.uky.edu/WaterResources/Watershed/KRB_AR/printable_reports.htm	2.8	USGS Water-Data Report KY-05-1, p. 188-271; waterwatch.usgs.gov/?m=flood&r=ky&w=real,table
	14-Oct	2.9	Water Questions and Answers: ga.water.usgs.gov/edu/mqanda.html and USGS Circular 1344	2.9	Water use in the United States: water.usgs.gov/watuse/ and ga.water.usgs.gov/edu/msac.html
9	17-Oct	2.10	Surface water use in the US: ga.water.usgs.gov/edu/wusw.html and USGS Open-File Report 2007-1209	2.10	KY water use 2005 kyco2005.xls
	19-Oct	2.11	USGS Water-Resources Investigations 03-4180	2.11	Realtime records of Kentucky River at Frankfort (1987-2009): ida.water.usgs.gov/ida/available_records.cfm?sn=03287500
	21-Oct	2.12	USGS Scientific Investigations Report 2004-5030	2.12	Realtime data for the Kentucky River: waterwatch.usgs.gov/?m=flood&r=ky&w=real,table
10	24-Oct	2.13		2.13	KY water use 2005 kyco2005.xls
	26-Oct				
	28-Oct		Kentucky River history: www.nandwphoto.com/Kentucky River Development.pdf www.eric.ed.gov/PDFS/ED423105.pdf		
11	31-Oct	3.1	quickfacts.census.gov/qfd/states/21/21067.html	3.1	Kentucky American Water pipeline issues
	02-Nov	3.2	quickfacts.census.gov/qfd/states/21/21067.html	3.2	Compiling census data for Fayette County: quickfacts.census.gov/qfd/states/21/21067lk.html
	04-Nov	3.3	Climate change and Kentucky: nepis.epa.gov/Adobe/PDF/40000PRQ.PDF www.kftc.org/publications/nancys-research/Climate Change, Coal - Ky.pdf Journal Research: Groisman et al. (2005): Journal of Hydrometeorology, v 5, p. 64-85	3.3	Climate change and water: www.ipcc.ch/pdf/technical-papers/climate-change-water-en.pdf
12	07-Nov	3.4		3.4	
	09-Nov	3.5	office.microsoft.com/en-us/excel-help/	3.5	Monte Carlo forecast of Kentucky River water suppplies
	11-Nov	3.6		3.6	
13	14-Nov	3.7		3.7	
	16-Nov	3.8	Geological Society of America style: www.geosociety.org/pubs/geoguid5.htm	3.8	
	18-Nov	3.9	Review of written projects	3.9	Writing an abstract
14	21-Nov	3.10		3.10	
	23-Nov				
	25-Nov				
15	28-Nov				
	30-Nov				
	02-Dec				
16	05-Dec				
	07-Dec				
	09-Dec				
17	tba				

General Education Course Approval Cover Sheet

Date of Submission 09 / 02 / 10

1. Check which area(s) this course applies to

Inquiry – Arts & Creativity	☐	Composition & Communications - II	☐
Inquiry – Humanities	☐	Quantitative Foundations	☐
Inquiry – Nat/Math/Phys Sci	☑	Statistical Inferential Reasoning	☐
Inquiry – Social Sciences	☐	U.S. Citizenship, Community, Diversity	☐
Composition & Communications - I	☐	Global Dynamics	☐

2. Provide Course and Department Information.

Department: Earth & Environmental Sciences

Course Prefix and Number: GLY 185 Credit hours: 3

Course Title: Quantifying the Bluegrass Water Supply

Expected Number of Students per Section: 100 Course Required for Majors in your Program (check one)? Yes ☐ No ☑

Prerequisite(s) for Course? n/a

This request is for (check one) A New Course ☑ An Existing Course ☐

Departmental Contact Information

Name: J. Richard Bowersox Email: jrbowe3@uky.edu@uky.edu

Office Address: _____ Phone: 323-0536

3. In addition to this form, the following must be submitted for consideration:

- A syllabus that conforms to the Senate Syllabi Guidelines, including a mapping of the stated learning outcomes to those presented on the corresponding Course Template.
- A completed Course Review Form. See the Gen Ed website http://www.uky.edu/gened/forms.html for these forms. Proposals prepared prior to September 15th, 2010 are allowed to use a narrative instead of the Course Review Form. ✓
- If applicable, a major course change form for revision of an existing course, or a new course form for a new course.

4. Signatures

Department Chair: D. Ravat D. Ravat dm. Date: 9/2/10

Dean: A. Bosch ARBosch Date: 9/21/10

All proposals are to be submitted from the College Dean's Office
Submission is by way of the General Education website http://www.uky.edu/gened

COURSE TITLE:

GLY 185 Quantifying the Bluegrass Water Supply
An Introductory Course in Quantitative Reasoning

COURSE NARRATIVE:

The goal of this course is for students to develop the ability to locate and identify data, critically evaluate the data, develop probabilistic models, and present the results of their research. Statistical elements in this course are at the level of basic skills in descriptive statistics. Details of course modules, topics, exercises, and exams is found in the attached Schedule of Topics and Evaluations.

Geology provides important information on the origins of natural resources and the amounts available for exploitation and use. Data sets used throughout the course are illustrative of the environmental issues surrounding the water supply and demand in the central Kentucky Bluegrass region, and the Kentucky River basin counties. Relevant data sets that have been compiled for use in this course include population and economic censuses (US Census Bureau), precipitation (Midwestern Regional Climate Data Center), and Kentucky River flow and demand (US Geological Survey).

The course will be taught in subject three subject modules. Class sessions will consist of explanatory lectures and short, active learning exercises illustrative of the day's topic by the course instructor. Recitation sessions (titled "Connections") will led by graduate teaching assistants under the course instructor's supervision, and summarize the week's topics through a more in-depth exercise in a lab-like setting. Students in recitation sessions will require access to computers with a minimum of Microsoft Office, a web browser, Google Earth for GIS exercises, and an internet connection. Other software required for the course will be determined by the course instructor on an as-needed basis.

This course is structured progressively, such that outcomes of the first two modules are the skills applied to complete the third module. But more than the "how?" of techniques, students will learn the "what and why?," and that it is ok to ask, "How is that known?" and, "Why not?" alternatives. That is, students will learn to evaluate, interpret, and challenge data and models of all kinds.

I Core Competencies That the Course Will Address

A. Mathematical and Logical Foundations

Mathematical and logical foundations will be emphasized in the first two course modules. The first course module, *"We need information, Number Six!"* addresses mathematical foundations by introducing the concepts of:

- Information and data;
- Independent, continuous, and time series data;
- Data sources and credibility;
- Descriptive statistical tests of data quality, relationships, and probabilities; and,
- Data presentation in tables, charts, graphs, and maps including GIS and contour maps.

This module consists of ten class and three recitation sessions, and composes 30% of the course. These data sets are illustrative of good-quality, independent (census), continuous (precipitation), and times series data (river flow). Students will learn how these data sets were collected and compiled, their uses, and learn their limitations, and limitations of how data in used and interpreted, through the application of descriptive statistical techniques. Assessments will include in-class exercises, homework assignments, and an exam at the conclusion of the module where the students will demonstrate their proficiency with the material.

The second module, *By the Rivers of Babylon...*, builds on the foundations of the first module, expands on the concept of probability, and introduces GIS approaches to analysis and presentation:

- Describing the Earth's surface and surface data through maps;
- Estimating the size of a river's drainage basins using GIS methods;
- Measurement of water supply from precipitation and runoff data;
- Estimating probability and magnitude of floods along the Kentucky River; and,
- Summarizing the Kentucky River supply in charts, graphs, and maps

This module consists of 13 class sessions and four recitation sessions, composing 40% of the course. In this module students will learn and practice more advanced techniques in descriptive statistics, probability, and GIS presentation. Census data and demographics will be introduced early in this module in an exercise using Google Earth for presenting GIS data. Following this, the balance of the module focuses on the Kentucky River basin and its water supply. Discrete, continuous, and time series data will be used for students to gain understanding of how components of the hydrologic cycle apply to the Kentucky River and forecast water supply and demand. Assessments will include in-class exercises, homework assignments, and an exam at the conclusion of the module where the students will demonstrate their proficiency with the material. Analyses, tables and graphic materials from this module will be used in the third module to develop a probabilistic model of the Kentucky River water supply, and be incorporated in the final written reports.

B. Statistical Foundations

In the third module, *"Water, water, everywhere, nor any drop to drink,"* students will model and forecast the sustainability of the Kentucky River basin water supply from its sources, population demographics, and considering the impact of climate change models. This is a real-world research project that incorporates:

- Water supply history of the Kentucky River;
- Population demographics and water demand for the Kentucky River basin;
- Evaluation of climate change models and their forecasts for the Kentucky;
- Assessing and compiling data necessary for their models;
- Developing their water supply and demographic models in Excel;
- Developing a probabilistic forecast of water supply and demand in Excel; and
- Preparing and submitting a written report synthesizing their research.

The module consists of ten class sessions and three recitation sessions, composing 30% of the course. In this module students will complete their research into the Kentucky River water supply and demand, demographics of the Kentucky River basin, assess climate models, and be introduced to scientific writing. They will prepare models for hydrologic and demographic data, then prepare a probabilistic forecast for water supply and demand in the Kentucky River basin that incorporates climate change models. The final product of this module, and the course, is an evidence-based written report discussing the student's model and forecast, supported by its tabular and graphical content. Assessments will include in-class exercises, homework assignments, and an exam at the conclusion of the module where the students will demonstrate their proficiency with the material.

II. Assessment that will demonstrate these competencies

A. Assessment will include in-class exercises, homework assignments, and an exam at the conclusion of each of the three modules.

B. Students will complete a comprehensive report presenting evidence-based summary of their modeling and a forecast of probable water supply/demand scenarios for the Kentucky River basin.

C. Data visualization including tables, graphical presentations, GIS applications developed in Google Earth, will aid understanding and interpretation of diverse data sets.

III. Learning Outcomes

A. Students will demonstrate proficiency with number sense:

1. Order of magnitude, estimation, comparisons, and effect of operations using Kentucky River flow data sets.

2. Functional relationships between two or more sets of variable values using data sets of Kentucky River flow and Kentucky River basin precipitation records.
   a. When one or more variables depend upon other variables: The relationship between Kentucky River flow and different measurement stations compared to the drainage area of the river basin at the stations.
   b. when one or more variables are functions of other variables: The relationship of Kentucky River flow and precipitation in the Kentucky River basin.

B. Relate different representations of such relations in order that students will be prepared for the Statistical Inferential Reasoning course.

These methods will be introduced in the first course module, revisited and additional methods introduced in the second course module, then applied to a real-world research project in the third course module. Methods include algebraic and symbolic representations; construction table, graphs, and maps; and verbal and written presentations in recitation sessions.

C. Apply fundamental elements of mathematical, logical, or statistical knowledge to model and solve problems drawn from real life.

1. Recast and formulate everyday problems onto appropriate mathematical or logistical systems (viz. algebra, geometry, logic), represent those problems symbolically (i.e., in numbers, letters, or figures), and express them visually or verbally.

Exercises in each course module are designed to develop these skills in students through the use of real-world data sets of Kentucky River basin water flow, precipitation, and demographic data. Methods include algebraic and symbolic representations; construction table, graphs, and maps; and verbal and written presentations in recitation sessions.

2. Apply the rules, procedures, and techniques of appropriate deductive systems (e.g., algebra, geometry, logic) to analyze and solve problems.

This course is structured progressively, such that outcomes of the first two modules are the skills applied to complete the third module. Descriptive statistics are introduced early-on in the first course module, then applied at each step in the analysis, model building, and forecast development in the second and third course modules.

3. Apply correct methods of argument and proof to validate (or invalidate) their analyses, confirm their results, and to consider alternative solutions.

Descriptive statistics are introduced in the first course module, then revisited in the third course module during the model and forecast development from the standpoint of avoiding "garbage in, garbage out," and whether or not the results of their models and forecasts are supported by their data or by alternative solutions.

4. Interpret and communicate their results in various forms, including in writing and speech, graphically and numerically.

   The final product of this module, and the course, is an evidence-based written report discussing the student's model and forecast, supported by its tabular and graphical content.