**GEOG601: The Nature and Practice of Science**

**Fall, 2017**

**Instructor:** Klaus Hubacek (best communication is by email: hubacek@umd.edu)

**Class time and place**: Monday, 14:00 – 16:30 PM, 1171 LeFrak Hall.

**Office hours:** Mondays, 13.00-14.00, 1127 LeFrak Hall

**Learning outcomes and overview:**

The objectives of the course are: (1) to provide students with an introduction to the nature and practice of science, including the process of criticizing one’s own work and the work of others; (2) to provide an enhanced graduate student experience through exposure to teaching and facilitating group work, which will enhance your ability to better work in groups, effectively communicate as well as with presenting and defending research ideas.

By the end of this class students should be able to demonstrate awareness of the relationship between philosophy science, theory and research practice, different disciplinary and interdisciplinary research paradigms and strategies, the standards required from graduate research, and some of the soft skills needed to do and communicate research. The students should understand the relationships between theory, conceptualization, method, hypotheses or research questions, evidence and measurement. They should be aware of key issues related to objectivity (and biases), generalizability, reliability and utility of research. They should have identified an individual project of appropriate scale and scholarly merit for a PhD thesis and developed the skills to prepare a grant proposal.

This course consists of directed readings, in-class discussions, presentations, student-led class sections, and preparing a written research proposal and a poster. Students are expected to be engaged in the material, to have read assigned articles, and to contribute to in-class discussions. Grading will be based on course participation, presentations and a written proposal. The course covers four modules: (1) practical issues of day to day research, (2) conceptual issues of research quality, (3) preparing a research proposal, and (4) teaching and facilitating group work. For the last item (4) please observe a class and reflect on aspects you like and don’t like, and how the instructor uses (or does not use) effectively the elements of our teaching text book. Write a blog about it and upload at the beginning of the spring semester to our discussion list for GEOG788D.

**Course structure:** Meetings will involve guided discussions, lectures, student-led discussion of weekly readings, student-led presentations, student-led class sessions, evaluation of peer research proposals and in-class exercises.

**Course Material:**

* Ambrose Susan A., M.W. Bridges, M. DiPietro, M.C. Lovett, M.K. Norman (2010). How Learning Works: Seven Research-Based Principles for Smart Teaching. Wiley.
* In addition, readings from the primary literature and textbooks will be made available on the course website (ELMS).
* Resources from the Teaching & Learning Transformation Center <http://tltc.umd.edu/> as well as other teaching material from the www.

**Course assessment:** Students are expected to debate with their peers. Assessment will be based on participation in in-class discussions and activities and successful completion of assignments.

**Provisional schedule of subjects (subject to change)**

**Week 1 (August 28, 2017)**: This week will mainly provide an overview of the class, introductions and interests of the class participants. You can suggest topics that you think are important but are currently missing. We will have a few older students come to class to give us some reflections on their experiences as a PhD student at this department and what they wished they had known when they started out this process.

**Week 2 (September 4, 2017)**: **no class – labor day**

**Week 3 (September 11, 2017)**: On being a scientist. We will discuss the academic job market, including the probability of landing a tenure-track position. We might also start thinking about our understanding of what is science. We will also discuss our teaching text book

**Week 4 (September 18, 2017)**: What is science? We will discuss the question ‘what is science?’ from the perspective of disciplines within physical and human geography and other fields. We will explore your favorite examples.

**Week 5 (September 25, 2017): No Class**

**Week 6 (October 2, 2017):** We will start with exploring various ways of presenting your research. This time we will explore flashtalks and you will give a 3-minute elevator speech about your research.

*Teaching session 1*

**Week 7 (October 9, 2017)**: This week we will explore Kuhn’s notion of paradigm. We will use this framework to discuss how literature or evidence is used in the climate discourse.

*Teaching session 2*

**Week 8 (October 16, 2017)**: Famous examples of major advances in science and the ingredients of a complete research program. This week we will look at some outstanding examples of major advances in science, and we will learn a framework that characterizes four components of an ‘ideally complete scientific episode.’

*Teaching session 3*

**Week 9 (October 23, 2017)**: Students will present a research proposal to the class during a short talk. Students will provide critical feedback.

**Weeks 10 (October 30, 2017)**:

Short presentations continued

**Week 11 (November 6, 2017):**

This week we will discuss the role of external funding in research. We might also explore the changing role of funding for Universities and the Neoliberal University. We will explore why scientists need funding, and how it is acquired, how it is spent, and where it comes from. We will discuss funding rates (i.e. the probability of success of a grant proposal). We will also discuss the role of funding in promotions and advancement, and how this varies among disciplines. You will have the opportunity to review both successful and unfunded grant proposals from members of the faculty.
In addition, we might invite some successful grant writers to tell us about their strategies.

*Teaching session 4*

**Week 12 (November 13, 2017):**

Dealing with scientific literature. This week we will examine the scientific literature, including what it is, the meaning of the term ‘peer-reviewed’, how to access literature, how to cite it, how to search it, how it is evaluated, and why you are expected to contribute to it. This week will include a practical exercise that will teach you how to use a citation manager to cite original research in your writing.

*Teaching session 5*

**Week 13 (November 20, 2017)**: A year (or two or more) in the life of a manuscript. This week we will go through the process of preparing a manuscript for publication in a peer-reviewed journal, submitting it, handling peer-reviews, and revising the paper for final submission.

*Teaching session 6*

**Final drafts of research proposals are due** before or after Thanksgiving – whatever works best. You have to keep in mind that you have to read a number of proposals assigned to you as referee.

**Week 14 (November 27, 2017)**: Strategies to increase research productivity. This week will discuss a wide range of strategies to increase research productivity, including the method of multiple working hypotheses and efficient time management. We will learn about the concept of ‘diminishing returns’, the relationship between ‘warm-up time’ and time-away-from-research, and the matrix of urgent/non-urgent and important/unimportant problems.

*Teaching session 7*

**Week 15 (December 4):** This week we will discuss the many ways that research findings can be disseminated to a broad audience, including conferences (short talks, posters), research talks (long talks). We will also discuss additional ways of communicating your work through the popular press, visualizations, and education, as well as new media, blogs, and specialized web portals such as researchgate, slideshare, academia.edu, newsletters, twitter, facebook,… . Students will introduce a specific tool/website to the class.

**Week 16 (December 11)**: The final weeks of the course will include a mock panel review of research proposals. We will review your research proposals, and we will evaluate them using the NSF’s merit review criteria. Each student will review multiple proposals, so that each proposal has multiple peer reviews. We will select 1 proposal to be ‘funded’.

**Medical Absences:** Campus Senate policy requires students who are absent due to illness/injury to furnish documentary support to the instructor. For this course, I require students to contact me by email or by phone prior to class time in which you indicate that you have an illness or an injury, or as soon as possible if the treatment by medical personnel conflicts with this requirement. You must provide written documentation verifying your illness/injury immediately upon your return to class.

**Attendance policy:** Attendance is mandatory with exceptions for medical absences (see above), religious holidays, or unexpected closure of the University of Maryland (e.g., snow, other emergency).

**Disability:** Students with disabilities are encouraged to contact the instructor. Arrangements will be made to accommodate students with disabilities.