Functions and Modeling, Fall 2016

What is this course about? This course provides a conceptually rigorous treatment of the central ideas of secondary mathematics. Much of the mathematical content in this course will seem familiar by topic name, but it will be explored and developed from a very different perspective. The focus will be on constructing meaning for concepts and on building coherence of meaning across concepts and various representations of them. The immediate aims of the course are that you significantly deepen your understanding of core ideas in the high school mathematics curriculum, and that you come to see them as being conceptually coherent and providing a foundation for a host of other seemingly disconnected concepts. The long-term aim is to support your ongoing efforts to develop an orientation to know and teach high school mathematics for understanding —a core feature of the teacher certification track of the mathematics major. As such, course activities and assessments (class activities, homework assignments, exams) will reflect these expectations: they will focus on both doing high school mathematics with meaning and on expressing and communicating that meaning accurately and coherently in verbal and written form.

Course objectives: The primary purpose of this course is to develop the following competencies:

- Mathematical content knowledge for teaching secondary mathematics
- Understanding of the process of learning key ideas of secondary mathematics, including but not limited to ideas of quantity, rate of change, proportionality, function, linearity, exponential growth, and trigonometric functions.
- Connections among major ideas of secondary algebra, precalculus, and calculus.
- Construct mathematical arguments and communicate them both verbally and in writing.

To achieve these goals, this course will often involve active participation on your part. Many classes will consist of small group activities and whole class discussions. You are expected to attend every class period prepared to actively contribute to both your own learning and the learning of your classmates. This includes asking questions, answering questions, making conjectures, giving explanations, and presenting solutions.

Instructor: I am Dr. John Paul Cook. Please feel free to contact me using any of the following:

- *Office Hours*: My office is room 406 (fourth floor) of the Mathematical Sciences building, and my office hours are on Tuesdays (2pm to 3:30pm) and Thursdays (2pm to 3:30pm); also by appointment as needed.
- *Email:* cookjp@okstate.edu
- *Skype:* username: cookjohnpaul
- *Google Hangouts/GChat:* username cookjohnpaul@gmail.com (please only use this username for Hangouts; if you'd like to email me, please use my official @okstate email)

Course Communication and Website: Important course announcements, whenever possible, will be made in class. I will also make use of the following methods to disseminate course information:

- Your official @okstate.edu email
- The class's Desire2Learn page (online.okstate.edu)

If you are interested, I'd recommend signing up for the free class texting service: text @osufm to the number 81010.

Course Materials: there is no textbook for this course. The course materials will generally consist of a set of notes, activities, and worksheets that I will provide. If you have a graphing calculator, it will be helpful to bring it to class, but purchasing a calculator is not required.

Grades, or, how your progress towards the course objectives will be evaluated: Your experience with grades in mathematics courses might unfortunately share some resemblance to following sentiment:

> 'We tend to teach mathematics as a long list of rules. You learn them in order and you have to obey them, because if you don't obey them you get a C—. *This is not mathematics*.'
>
> – Jordan Ellenberg, *How Not to Be Wrong*, p. 12

I have endeavored to design the evaluation methods and criteria in this course to avoid an 'obey the rules or get a C—' classroom environment. In this class, we adopt something closer to the following stance:

> 'First, learning is a developmental process rather than only a question of acquisition. Learning entails primarily intellectual and personal changes that people undergo as they develop new understandings and reasoning abilities … grading becomes not a means to rank but a way to communicate with students.'
>
> – Ken Bain, *What the Best College Teachers Do*, p. 153

You will have many opportunities to demonstrate evidence of your learning and progress in this course:

- *Homework and Quizzes:* The best way to learn mathematics is to do mathematics. Practicing and thinking about concepts and skills in this course outside of class on a regular basis is critical to learning abstract algebra. On each homework assignment, you are expected to attempt each problem and to explain your efforts, even if these efforts did not result in a correct solution. Because of the importance of keeping pace with the course content, all homework should be submitted on time in class on the due date -- late assignments are not accepted, and quizzes are not allowed to be rescheduled (another reason for this: we will likely discuss quiz and homework problems in class after the assignment has been submitted, and I am not interested in your ability to copy down someone else's solutions, but rather your ability to think through and reason about the concepts in this course). Fortunately, though, there are many other opportunities, and I will drop your lowest two scores from this category at the end of the course. Moreover, homework and quiz scores will be averaged and scaled to 25% of your overall grade.

- *Project:* At the end of the semester, you will complete a course project, which will provide you with an opportunity to synthesize the content across this course and its relationship to secondary mathematics. More details will be given after the midterm exam. The final project is worth 25% of your overall grade.

- *Exams:* Whereas the point of homework and quizzes is to help you learn something, the motivation behind an exam is for you to show what you have learned. There will be a midterm exam (25% of your overall grade) a comprehensive final exam (also 25%). The final exam will take place on **Tuesday, December 6th from 10:00am to 11:50am** in our usual classroom. Aside from a sudden, documentable illness or emergency, makeup exams are not permitted. Please come speak with me directly if you encounter circumstances that you believe merit an exception.

Your final course letter grade will be based on the standard 10 point scale: 90%-100% guarantees an A, 80%-89.99% guarantees a B, 70%-79.99% guarantees a C, 60%-69.99% guarantees a D.

What you can expect from me: I've spent this entire syllabus talking about what I expect from *you*. Let's change focus. Here is what you can expect from me: my overall goal, in addition to teaching you algebra, is to teach you to be an independent learner and a critical thinker. I want you to learn and, more importantly, learn how to learn. And, believe it or not, I'll enjoy it. I hope you do, too.