**MATH 3303: An Advanced Perspective on Functions and Modeling for Future Secondary Teachers**

**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 problems, etc) 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, calculus, and beyond.
* Construct mathematical arguments and communicate them both verbally and in writing.
* Connecting your advanced mathematical coursework to concepts in the secondary mathematics curriculum.

This course will be conducted with the belief that knowledge is actively constructed (not received) by the learner, and that the construction of knowledge requires interactions with your peers. Each class will consist of small group activities and whole class discussions. You will be expected to attend every single 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, and giving explanations. It also includes becoming comfortable with the notion that this class will, at times, make you uncomfortable. You will likely make many incorrect statements. And, believe it or not, this is a good thing – it will lead to progress.

You will be encouraged to reflect and think critically about the materials through a myriad of different assignments. Perhaps the main philosophy underpinning these assignments is that there is more to mathematics than procedures and calculations. There is a great deal of human activity involved as well: thinking, pattern-noticing, conjecturing, justifying, predicting, discussing, revising, reflecting, … the list goes on. These assignments might direct you to revise (and possibly prove or otherwise provide justification for) conjectures made in class, reflect upon your own thinking or the thinking of other students, think about how our class activities relate to the overall course objectives, or something else entirely. Whatever the case, the goal will be for you to think about the mathematical content in this class in a different way and bring these thoughts to the class for discussion. To contextualize our investigations, we will often refer to the main course objectives, including: (1) developing robust conceptual understandings of the foundational concepts of secondary mathematics, while also (2) making connections between these concepts and your advanced mathematics coursework.

**Instructor:** Melissa Mills, Ph.D., Teaching Assistant Professor of Mathematics. Please feel free to contact me using any of the following:

* *Office Hours*: My office is in the Mathematics Learning Success Center on the 5th floor of the library. I’ll set specific office hours later. Of course, you can always meet with me by appointment as needed.
* *Email:* [melissa.mills@okstate.edu](mailto:melissa.mills@okstate.edu)

**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 Brightspace page (online.okstate.edu)

**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. You should bring a TI 83/84 graphing calculator to each class. All other materials (such as laptops) will be provided as needed.

**Course Credit:** this course is a requirement for those in the OSU-Teach program *and does not confer credit for the mathematics major or the mathematics minor*.

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

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| ‘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 |

The evaluation methods and criteria in this course have been designed to avoid an ‘obey the rules or get a C’ classroom environment. In this class, we adopt something closer to the following stance:

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| ‘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, *College Teachers*, p. 153 |

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

* *Course assignments:* 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. Assignments will come in a variety of forms: some might be typical homework assignments, some might be in-class quizzes or take-home exams, others could be more like projects. The weight for each assignment will be announced individually, with the base unit being “1 assignment.” For example, a typical homework might be worth 1 assignment, but a take-home exam might be worth 4 assignments.

While this setup is likely different than those that you’ve seen in other courses, this flexible structure enables me to cater the course specifically to you and your classmates. We aren’t as tied down by the content-related constraints of a typical mathematics course: we can devote additional time to discuss and explore certain concepts, and we have the freedom to explore them in different ways.

Your course grade will be based largely upon your *completion* of and *effort* towards these course assignments. At the end of the semester, the grades on all assignments, properly weighted, will be scaled to a percentage and then assigned a letter grade according to the typical 10-pt scale (90-100 A, 80-89 B, 70-79 C, 60-69 D, below 60 F). Participation will then be taken into account (see the paragraph below).

I should note that, even though the structure is designed to be flexible, I will endeavor to be as transparent as possible about your course grade: the grades for all assignments, appropriately weighted, will be posted in a timely fashion on online.okstate.edu. If you have any questions about your grade or the grading structure of this course, please don’t hesitate to ask.

* *Attendance and participation:* Attendance and participation are exceptionally important in this course. As future teachers, your ability to write and submit written assignments is important, but your ability to verbally articulate and discuss mathematical concepts – sometimes off the top of your head and on-the-fly – is perhaps more so. This is a difficult yet necessary skill for teachers, and the only way to develop that skill – at least within the context of this class – is to attend class and actively participate. Along these lines, you are expected to attend each class period. Each student will be granted 2 free absences to account for reasonable conflicts that arise over the course of a semester (illnesses, etc). Any additional absences make it extraordinarily unlikely that you are making sufficient progress towards developing the mathematical communication skills that are a keystone of this course (and, not to mention, mathematics teaching). The bottom line: simply turning in assignments is not enough to make sufficient progress towards the course goals. As a result, for every two classes missed beyond the allotted amount, you risk being penalized half a letter grade at the end of the course. Students who attend but do not engage with their classmates or with the investigations and tasks also risk the same penalty.

**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 mathematics, 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.

Now it’s time for the usual syllabus policies:

**Additional University Information:**

**Syllabus Attachment:** OSU has compiled useful information that applies to all classes. I have posted it in the “Content” section of our Brightspace page.

**Office of Equal Opportunity:** If you feel that you have been a victim of harassment or discrimination by anyone on or off campus, please contact the Office of Equal Opportunity (eeo.okstate.edu). This office will advocate for you in cases of sexual harassment, discrimination, ADA compliance, Affirmative Action and Title IX violations.

**Incomplete Grade:** The grade of "I" is given to students who satisfactorily completed the majority of the course work and whose work averages "D" or better, but who have been **unavoidably** prevented from completing the remaining work of the course. A condition that the students must repeat the course in order to remove the "I" is not permitted. The maximum time allowed for a student to remove an "I" is one calendar year.

**Academic Integrity:** The University has explicit rules governing academic integrity. Please consult the OSU Syllabus Attachment mentioned above. Working with another person or in study groups on problems can be helpful in learning the material. I encourage you to work together if you find it helpful. However, **all work submitted must be your own**. Academic dishonesty (cheating) will be dealt with as harshly as the university allows. Don't do it!

**Special Accommodations for Students:** If you need special accommodations to ensure equitable treatment in this class, please notify the instructor and request verification of eligibility for accommodations from the Office of Student Disability Services.

**The instructor reserves the right to make changes to this syllabus in order to accommodate the needs of the class. Any such changes will be announced in class.**