**SYLLABUS FOR MAC 2312, CALCULUS II**
**Revised Jan 2014; Coordinator: Steve Hudson**

**Textbook**: *Calculus, Early Transcendentals* - Tenth Edition, by Anton, Bivens and Davis. The Single Variable Edition contains all the relevant chapters for this course.

**Schedule of Topics**: The schedule below is based on a course that meets 100 minutes twice a week for 14 weeks. It assumes about 24 class periods for lectures, with the others used for review and exams (the norm is 3 exams plus a final, but this is flexible). The course includes about 32 sections of the textbook. In short semesters, such as summer terms, the instructor should avoid review sessions, numerous exams or quizzes, and some of the optional sections below. These sections should be covered in normal semesters.

This course is a pre-requisite for many others, not just MAC 2313. Students will need good calculation skills in differential equations and mathematical statistics, decent proof-writing skills in linear algebra and MAA 3200, and familiarity with approximation methods and applications in various courses. Cover Riemann sums well, many proofs, and polar area. Here, to *cover* a topic generally includes testing the student on it. The instructor can decide if and when to allow calculators on exams, non-graphing only, but the students must know the standard formulas, such as basic trig values, and this should be tested. Students entering MAC 2312 are required to have a C in MAC 2311, which goes through Ch 5.3.

**Chapter 5** Integration *Sections 4-10: about 5 lectures of 100-minutes [approx 7 shorter lectures].*

If you are sure there is time for it, you may review Ch 5.3 briefly, but normally should start with 5.4, and establish a good pace. Cover Riemann Sums, and the definitions of the integral and of the logarithm function in detail. Include plenty of practice with the Fundamental Theorem of Calculus, usually including the proof (if you cover formula (2) of 6.1 carefully, then a rigorous proof is optional). Notice that Ch 5.8, Average Value, has been moved into this chapter in the new edition, and it should be covered.

**Chapter 6:** Applications of Integration
*Sections 1-6, about 4 lectures.*

The student should learn to convert new word problems into integrals via Riemann sums. Justify the disk, washer and shell methods to firm up the idea of integration. You may omit a topic or two from sections 4-6 in a summer semester; also, the trickier antiderivatives that arise with arc length and surface area are optional. At a minimum, cover 6.1-6.3 and explain the arc length formula and a few non-geometric applications (eg Work).

**Chapter 7:** Techniques of Integration.
*Omit section 6 only: 5 or 6 lectures*

You can spend just a few minutes on integral tables. Department policy normally forbids formula sheets on exams, but you can make exceptions if you want to test the use of tables; also for reduction formulas and error estimates.

Require lots of student practice in this chapter, but don't get bogged down in class. Cover most of the numerical methods, with error estimates, and word problems involving data from tables. In a short semester, you may omit/reduce time on reduction formulas, applications, and the longer problems from sections 3-5.

**Chapter 9:** Infinite Series.
*Sections 1-10, 7 or 8 lectures.*

Cover all sections carefully with emphasis on the idea of convergence and the use of Taylor series.

Show how to use convergence tests and error estimates for Taylor series. and (if time permits) cover most of the proofs. Students must memorize the McLaurin series of the basic functions such as $1/(1-x)$, $e^x$, $\sin(x)$ and to be able to find others by substitution, multiplication, differentiation and so on. Include plenty of practice with intervals of convergence. Use power series to approximate functions and integrals, to compute limits, and perhaps to solve an ODE.

**Chapter 10:** Polar Coordinates, Parametric Equations, Area
*Sections 1-3: 2 lectures.*

In principle, the students should already have seen polar coordinates and parametric equations (without Calculus), but review these, if time permits. Cover tangent lines in 10.1, but this topic is optional in 10.3, as is arc length. Cover graphing and well-known families of curves in 10.2. Definitely cover the area formula and its 'proof' in 10.3, with non-trivial examples; this is needed for MAC 2313.