**MTH 230** – 201 (CRN 4069) **Spring 2016**

**Calculus with Analytic Geometry II** – Applications of the integral, techniques of integration, and infinite series. A study of conic sections, polar coordinates, and parametric equations. 4 hrs. (PR: *C* or better in MTH 229 or *C* or better in IST 230)

**Instructor:** Dr. Clayton Brooks (brooksc@marshall.edu)

**Office:** Smith Hall 723 (Note: the University does not grant me comprehensive telephone dialing access, so I am not able to return many calls. With this in mind, the number is x6-6702)

**Office Hours:** 10 – 11:30 MTWR, or by appointment

**Text:** Calculus (early transcendentals) 3/e by Jon Rogawski

**Technology requirement:** TI-83/4 or equivalent graphing calculator. Standard student access to the University Computing Facilities

**Course goals:**

1. To give students an understanding of the fundamental concepts of calculus and an appreciation of its many applications.
2. To develop critical thinking skills by asking students to convert real-world problems into forms suitable for calculus, and interpret the results of calculus in real-world problems.
3. To provide students with a deeper understanding of the mathematics that is used in their science and engineering courses.
4. To develop facility in using graphing calculators to solve mathematics problems.
5. To satisfy program requirements.

**Objectives:**

1. Students should be able to evaluate integrals and series, and solve basic differential equations symbolically.
2. Students should be able to approximate definite integrals and solutions to differential equations from tabular and graphical data.
3. Students should be able to graph and create functions defined in polar or parametric form.
4. Students should be able to differentiate and integrate functions in polar or parametric form.
5. Students should be familiar with the definitions of integrals, sequences, and series; be able to apply these definitions to test properties of these concepts; and be able to produce verbal arguments and examples showing that basic properties hold or do not hold.
6. Students should be able to verbally explain the meaning of integrals, sequences, and series in their own words, both in general terms and in the context of specific problems.
7. Students should be able to select or construct an appropriate function or differential equation to model an applied situation for which calculus is applicable, based upon a verbal description of the situation.
8. Students should be able to apply techniques of calculus to solve applied problems from fields such as engineering and the sciences.
9. Students should be able to interpret symbolic and numerical results in real-world terms, and analyze the validity of their results in a real-world setting.

**Learning outcomes:**

1. *Reasoning:* Calculus is a collection of reasoning techniques that allows one to understand how changing quantities behave. This understanding is fundamental to progress in science and engineering. Students will use mathematical reasoning in their study of calculus concepts to verify properties of the concepts they study, and they will use scientific reasoning to determine whether possible solutions are reasonable for a given situation.
2. *Representations:* Students will work with information specified in verbal, graphical, tabular, and symbolic forms. Many problems will require students to take information in one of these forms, analyze it, and create a solution in a different form. Students will be required to produce verbal explanations of the meanings of mathematical concepts, both in general and in the context of specific problems.
3. *Information literacy:* To solve the applied problems in this course, students must determine which information in the problem is relevant to the solution, access this information and use it to obtain a mathematical solution, and then translate the mathematical solution back into the language of the original problem.

**Grading:**

100 points (or less) for the total of homework, projects, and quizzes

100 points for each exam

200 points for the final exam

**Late penalties:**

A penalty of 1% reduction for each hour late will be assessed for any assignment. Make-up tests will not be given for any unexcused absence.

**Tutoring:**

Is available in Smith Music Hall 115, 10:00am to 4:00pm Monday to Thursday, and 10:00am to noon on Friday. See <http://www.marshall.edu/math/tutoringlab.asp> for more information.

**Schedule:**

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| **Week** | **Sections** | **Topics** |
| Jan 11 – 14 | 6.1 – 6.4 | Computing area, volume, average value |
| Jan 19 – 21 | 6.5 – 7.2 | Work, Integration by parts, Trig integration  |
| Jan 25 – 28 | 7.3 – 7.7 | Trig substitution, Partial fractions, Strategies, Improper integrals |
| Feb 1 – 4 | 7.9, Test | Numerical integration, **Test on Feb 4** |
| Feb 8 – 11 | 8.1 – 8.3 | Arc length, Surface area, Fluid pressure, Center of mass |
| Feb 15 – 18 | 8.4 – 9.2 | Taylor polynomials, Differential equations, DE models |
| Feb 22 – 25 | 9.3 – 9.5 | Direction fields, Euler’s method, Linear differential equations |
| Feb 29 – Mar 3 | Lab, Test | Visit to DA Lab, **Test on Mar 3** |
| Mar 7 – 10 | 10.1 – 10.2 | Sequences, Series |
| Mar 14 – 17 | 10.3 – 10.4 | Convergence, Alternating series  |
| Mar 28 – 31 | 10.5 – 10.6 | Ratio and root tests, Power series  |
| Apr 4 – 7 | 10.7 – 11.1 | Taylor series, Parametric curves  |
| Apr 11 – 14 | 11.2 – 11.3 | Arc length, Polar coordinates |
| Apr 18 – 21 | 11.4, Test | Area and arc length in polar coordinates, **Test on Apr 21** |
| Apr 25 – 28 | 11.5, Review | Conic sections |
| **May 3** |  | **Final Exam on Tuesday, 8:00 – 10:00** |