Course Outcomes Guide (COG)

Course Title: **MAT164 (3 Credits) CALCULUS W/APPLICATIONS**

Date: **08/25/17**

Course Team: **Tom Crawford**

STUDENT LEARNING OUTCOMES:

General Education/Program/Course Outcomes:

Upon successful completion of this course, students will learn how to:

G1. Apply mathematical methods involving arithmetic, algebra, geometry, and graphs to solve problems.

G2. Represent mathematical information and communicate mathematical reasoning symbolically and verbally.

G3. Interpret and analyze numerical data, mathematical concepts, and identify patterns to formulate and validate reasoning.

P/C1. Use computational techniques and algebraic skills essential for success in an academic, personal, or workplace setting. (Computational and Algebraic Skills)

P/C2. Use visualization, special reasoning, as well as geometric properties and strategies to model and solve problems. (Geometric Skills)

P/C3. Collect, organize, and display data as well as use appropriate statistical methods to analyze data and make inferences and predictions. (Statistical Skills)

P/C4. Critically analyze and construct mathematical arguments. (Proof and Reasoning)

P/C5. Use technology, where appropriate, to enhance and facilitate mathematical understanding, as well as an aid in solving problems and presenting solutions. (Technological Skills)

P/C6. Communicate and Understand mathematical statements, ideas and results, both verbally and in writing, with the correct use of mathematical definitions, terminology and symbolism. (Communication Skills)

P/C7. Work collaboratively with peers and instructors to acquire mathematical understanding and to formulate and solve problems and present solutions. (Collaborative Skills)

Assessment:

1. A common assessment (comprehensive final exam) for this course has been in place since SP2010 semester and data has been collected.
2. All historical data has been uploaded into the "Mathy" database.
3. The common assessment (CA) consists of a small number of skills questions and several application problems on a continuum of depth/breath.
4. All application questions are consistent with class examples and semester exam questions.

Validation:

1. CA results are evaluated only after final course grades are assigned by the instructor.
2. Correlation between students' course average and CA composite score is evaluated each semester.
3. CA question results that differ dramatically from historical values will establish content areas in need of corrective action and those where previous efforts to affect improvement have been successful.

Results:

1. Historical course averages are well correlated with CA results. SP16 course averages are well correlated with CA results.
2. SP16 Strength: Many items were completed more successfully that the historical average. Instructor removed significant content to accommodate algebra weakness. This gave increased attention to fewer of the assessed skills and applications.
3. SP16 Weakness: Item #4 (Cost Minimization) is a persistent problem area. Despite substantial in class practice and homework and review following quiz and exam inclusion students are not developing the capacity to "see" the problem and model it correctly. Memorization, or the refusal to not memorize, is the highway to disaster for most students in this class.
4. Lack of algebra understanding forces the students in this class to attempt to memorize their way through. This strategy has worked for them in previous math courses and many will happily settle for a "C". Preassessment (instituted at the last closing of the loop) data indicates a collective weakness in basic understand of essential concepts such as fractions as rates, slope, basic graphing, graph transposition, and problem modeling.

Follow-up:

1. Removing content to allow weak students to memorize their way to a measure of "success" is not an acceptable long-term solution. However, increased time on task and practice with conceptual topics did produce positive results in SP16. Therefore, until such time as algebra understanding among incoming students is increased and students are better able to work effectively independently, this course will only be offered in a lecture format.
2. Lecture format will provide additional time for remedial algebra coverage with an emphasis on conceptual understanding and modeling rather than memorization.
3. Course did not have sufficient enrollment to run in AY 16/17.

Budget Justification:

1. No funding is required at this time for this course.

Course: MAT 164 **Lead Faculty: T. Crawford**

	SU11	FA11	SP12	SU12	SP13	FA13	SP14	FA14	SP15	SP16
# Active students	9	17	21	9	16	8	12	9	10	11
# Withdraw % Withdraw	11.1%	5.9%	23.8%		2 13%	1 12.5%	1 8.3%	2 22.2%	2 20%	2 18.2%
# Walkaway Fs % Walk-Away Fs*				33.3%	3 19%	0 0%	2 16.7%	1 11.1%	1 10%	1 9.1%
# Success (A,B,C) % Success (A,B,C)	87.5%	82.4%	61.9%	66.7%	9 57%	7 87.5%	8 66.7%	5 55.6%	5 50%	7 63.6%
Gen Ed SLOA	N/A	N/A	N/A	N/A	79%	N/A	82%	73%	67%	75%
Course SLOA	57%	60.4%	42%	65%	56%	57%	56%	54%	43%	61%**
SLOA Item Analysis					S-1,2 W-3	S-7 W-4	S-2 W-5	S-7 W-4	S-2 W-3	S-1 W-4
Mean Course Grade	2.57	2.81	2.38	2.0	2.21	3.29	2.27	2.29	2.38	2.78

*Did not take the final exam and received a grade of F.

**Not all questions were included. Course content was removed to accommodate algebra weakness.

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MAT164 COURSE SLOA RESULTS

	Format	Course SLOA	Q1	Q2	Q3	Q4	Q5	Q6	Q7
SP11	Web	22.56 56%	0.74	0.64	0.48	0.31	0.26	0.45	0.48
SU11	Web	22.75 57%	0.65	0.74	0.43	0.00	0.10	0.90	0.67
FA11	Lec	24.16 60%	0.61	0.52	0.61	0.44	0.73	0.46	0.51
SP12	Web	16.86 42%	0.48	0.44	0.33	0.26	0.44	0.26	0.41
SU12	Hyb	25.92 65%	0.75	0.75	0.70	0.07	0.38	0.63	0.70
SP13	Lec	22.23 56%	0.70	0.60	0.45	0.18	0.27	0.50	0.64
FA13	Web	22.71 57%	0.64	0.51	0.61	0.19	0.4	0.49	0.71
SP14	Hyb	22.44 56%	0.61	0.7	0.46	0.28	0.23	0.63	0.60
FA14	Hyb	23.42 54%	0.63	0.64	0.47	0.23	0.37	0.53	0.8
SP15	Hyb	18.57 43%	0.48	0.61	0.27	0.29	0.43	0.46	0.39
SP16*	Hyb	18.25 42%	0.71	N/A	0.53	0.09	0.83	0.50	N/A
Overall	All	22.48** 56%	0.65	0.63	0.48	0.24	0.44	0.51	0.61

*Not all questions were included. Course content was removed to accommodate algebra weakness.

**Calculated as though all questions were included in SP16. So, this value is artificially low.
Impact of this calculation is minimal (<1% difference) and will decline over time.