

Course Outcomes Guide (COG)

Course Title: MAT164 (3 Credits) CALCULUS W/APPLICATIONS
Date: 6/8/18
Course Team: Tom Crawford

STUDENT LEARNING OUTCOMES:

General Education: Upon successful completion of this course, students will have demonstrated the capacity to effectively...

- 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.

Course: Upon successful completion of this course, students will have demonstrated Calculus Literacy (CL), and Calculus Reasoning (CR).

CL - Calculus Literacy involves understanding and using the basic language and tools of calculus: knowing what calculus terms mean, understanding the use of calculus symbols, and being able to express (in calculus terms) graphical representations, and perform basic calculus computations.

CR - Calculus Reasoning is the way people process with calculus ideas, make sense of calculus applications, and interpret calculus solutions. Calculus reasoning may involve connecting one concept to another (e.g., derivative and relative min/max) or may combine ideas about rate of change and practical implication. Reasoning means understanding and being able to explain calculus processes, and being able to fully interpret calculus results.

These skills/abilities will be applied to the follow course concepts generating 6 distinct course outcomes: CL1, CR1, CL2, CR2, CL3, CR3.

- 1 – Functions
- 2 – Derivatives
- 3 – Integrals

Assessment:

1. A common assessment (comprehensive final exam) for this course has been in place since the SP10 semester.
2. CA data is added to the “Mathy” database at the conclusion of each semester.
3. Class realities (SP16) and course revision (FA17) have resulted in ongoing CA revisions.
4. The common assessment (CA) consists of a small number of skills questions and several application problems on a continuum of depth/breath.
5. 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 un/successful.

Results:

1. To address underdeveloped algebra skills/understanding this class was only offered in a full lecture format during FA17 & SP18. This has provided additional instructional time for remedial algebra coverage with an emphasis on conceptual understanding and modeling rather than memorization. Still, this remedial algebra focus places time pressure on the completion of all content included in the course outcomes.
2. Historical course averages are well correlated with CA results. FA17 & SP18 course averages are well correlated with results on the modified CA.
3. FA17 & SP18 Strength: Items #1, 3, 4, & 5 showed improvement above historical averages of 42%, 35%, 108%, and 36% respectively. This is very encouraging but small sample size (n=11) should be considered.
4. FA17 & SP18 Weakness: Items 2, 6, & 7 were not included in the assessment as this content was removed to accommodate algebra weakness.
5. A textbook switch to common attribution license OER accompanied the course revision to only offer lecture sections. Students have greeted this OER with initial joy at the absence of any cost but have commented that the lack of sufficient practice problems and the instant feedback provided by a CMS are troublesome.

Follow-up:

1. Course will continue to only be offered in the lecture format until algebra remediation is no longer widely necessary.
2. Modification of the CA will continue in hopes of restoring all content and allowing for full historical comparisons.
3. Combining an OER text with an adaptive learning technology housed within a low cost CMS will be investigated. It is hoped that adaptive learning technology will provide the remedial work most students currently need while freeing up class time to cover those topics that have been previously removed in order to address underdeveloped algebra skills/understanding.

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	FA17	SP18
# Active students	9	17	21	9	16	8	12	9	10	11	9	9
# Withdraw % Withdraw	11.1%	5.9%	23.8%		2 13%	1 12.5%	1 8.3%	2 22.2%	2 20%	2 18.2%	3 33.3%	2 22.2%
# Walkaway Fs % Walk-Away Fs*				33.3%	3 19%	0 0%	2 16.7%	1 11.1%	1 10%	1 9.1%	1 11.1%	1 11.1%
# 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%	3 33.3%	6 66.7%
Gen Ed SLOA	N/A	N/A	N/A	N/A	79%	N/A	82%	73%	67%	75%	69%	77%
Course SLOA	57%	60.4%	42%	65%	56%	57%	56%	54%	43%	61%**	72%**	69.7%**
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	S-1,3,4,5	S-1,3,4,5
Mean Course Grade	2.57	2.81	2.38	2.0	2.21	3.29	2.27	2.29	2.38	2.78	1.17	2.00

*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.

***Course revision - CA being revised

MAT164 COURSE SLOA RESULTS

	Format/#	Course SLOA	Q1	Q2	Q3	Q4	Q5	Q6	Q7
SU11	Web/6	22.75 57%	0.65	0.74	0.43	0.00	0.10	0.90	0.67
FA11	Lec/16	24.16 60%	0.61	0.52	0.61	0.44	0.73	0.46	0.51
SP12	Web/14	16.86 42%	0.48	0.44	0.33	0.26	0.44	0.26	0.41
SU12	Hyb/6	25.92 65%	0.75	0.75	0.70	0.07	0.38	0.63	0.70
SP13	Lec/11	22.23 56%	0.70	0.60	0.45	0.18	0.27	0.50	0.64
FA13	Web/7	22.71 57%	0.64	0.51	0.61	0.19	0.4	0.49	0.71
SP14	Hyb/8	22.44 56%	0.61	0.7	0.46	0.28	0.23	0.63	0.60
FA14	Hyb/6	23.42 54%	0.63	0.64	0.47	0.23	0.37	0.53	0.8
SP15	Hyb/7	18.57 43%	0.48	0.61	0.27	0.29	0.43	0.46	0.39
SP16*	Hyb/8	18.25 61%	0.71	N/A	0.53	0.09	0.83	0.50	N/A
FA17*	Lec/5	17.9 71.6%	0.92	N/A	0.72	0.48	0.56	N/A	N/A
SP18*	Lec/6	18.83 75.3%	0.92	N/A	0.60	0.55	0.63	N/A	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.