

## Course Outcomes Guide (COG)

**Directions:** Please complete this form to document your progress toward improving student learning. For each item, indicate your progress and your anticipated next steps. Thank you!

**Course Title:** MAT 204, Calculus II

**Date:** Fall 2015, Spring 2016

**Course Team:** Christopher J. Lewis, Larry Wadel, Adrian Martin

### Expected Learning Outcomes

#### Course Outcomes:

In this course students will acquire:

- 1) **TECHNICAL COMPETENCY** in the methods of calculus that will enable them to apply the various techniques of integration to evaluate indefinite, definite and improper integrals, and determine arc length, surface area and volume, as well as apply calculus to parametric and polar coordinate equations. Students will be able to apply a variety of tests to determine convergence/divergence of sequences and series. Students will also be able to represent functions by power series, determine intervals of convergence, and provide estimates of error. (*Supports Mathematics Program Outcomes 1, 2, 4 and 5*)
- 2) **CONCEPTUAL UNDERSTANDING** of the formulas, techniques and theory that are developed. Conceptual understanding will be reinforced from numeric, geometric, algebraic and written/verbal perspectives (**The Rule of Four**). Students will be required to provide heuristic and visual justification of important results. (*Supports Mathematics Program Outcomes 1, 2, 4, 5, 6 and 7*)
- 3) **UTILITY** in the methods of calculus. Students will use calculus to solve applied problems from a variety of disciplines ranging from biology, economics, business, engineering, and the social sciences, but primarily focusing on applications from physics and mathematics. (*Supports Mathematics Program Outcomes 1, 2, 4, 5, 6 and 7*)

**Assessment** (How do or will students demonstrate achievement of each outcome? Please attach a copy of your assessment electronically.)

Students demonstrate achievement of each outcome by scores on problems from AP Calculus BC exams that are correlated to the learning outcomes.

**Validation** (What methods have you used or will you use to validate your assessment?)

The mean score for HCC students for each problem is compared to the mean score of the AP Calculus BC test examinees. The comparison is reasonable since AP scores are used to determine college credit.

**Results** (What do your assessment data show? If you have not yet assessed student achievement of your learning outcomes, when is assessment planned?)

**Math 204-01 Fall 2015**

<b>Assessment Question</b>	1	2	3	4	5
<b>Learning Outcome</b>	1, 3	2, 3	2, 3	2	1, 3
<b>HCC Mean</b>	2.16	0.26	0.42	0.68	5.16
<b>AP Mean</b>	5.51	0.30	0.56	0.75	4.75
<b>HCC Mean minus AP Mean</b>	-3.35	-0.04	-0.14	-0.07	+0.41

The results indicate that HCC Math 204-01 students were nearly able to achieve learning outcomes with the exception of assessment question 1, where the HCC students scored significantly lower than the AP Calculus BC test examinees. This indicates more work on technical competency and utility, learning outcomes 1 and 3.

**Math 204-01 Spring 2016**

<b>Assessment Question</b>	1	2	3	4	5
<b>Learning Outcome</b>	1, 3	2, 3	2, 3	2	1, 3
<b>HCC Mean</b>	6.31	0.75	0.56	0.69	6.00
<b>AP Mean</b>	5.51	0.30	0.56	0.75	4.75
<b>HCC Mean minus AP Mean</b>	+0.80	+0.45	0.00	-0.06	+1.25

The results indicate that HCC Math 204-02 students were able to achieve learning outcomes as compared to AP Calculus BC test examinees. The only area suggesting slight improvement, as indicated by the score on question 4, is outcome 2, conceptual understanding.

**Math 204-02 Spring 2016**

<b>Assessment Question</b>	1	2	3	4	5
<b>Learning Outcome</b>	1, 3	2, 3	2, 3	2	1, 3
<b>HCC Mean</b>	4.83	0.50	0.58	1.00	4.33
<b>AP Mean</b>	5.51	0.30	0.56	0.75	4.75
<b>HCC Mean minus AP Mean</b>	-0.68	+0.20	+0.02	+0.25	-0.42

The results indicate that HCC Math 204-02 students were nearly able to achieve all learning outcomes as compared to AP Calculus BC test examinees. The only areas of possible improvement, as indicated by the score on question 1, are outcomes 1 and 3, technical proficiency in applying formulas to solve utility problems.

**Math 204-S02 Spring 2015**

<b>Assessment Question</b>	1	2	3	4	5
<b>Learning Outcome</b>	1, 3	2, 3	2, 3	2	1, 3
<b>HCC Mean</b>	1.75	0.50	0.50	0.75	5.25
<b>AP Mean</b>	5.51	0.30	0.56	0.75	4.75
<b>HCC Mean minus AP Mean</b>	-3.76	+0.20	-0.06	+0.00	+0.50

This was a small class of dual enrolled students at Greencastle HS. Only 4 students completed the assessment. The results indicate that the students were able to achieve learning outcomes as compared to AP Calculus BC test examinees. The only areas of possible improvement, as indicated by the score on question 1, are outcomes 1 and 3, technical proficiency in applying formulas to solve utility problems.

**Follow-up** (How have you used or how will you use the data to improve student learning?)

The results indicate that more practice with utility problems that apply arc length formulas to calculate perimeter and revolution formulas to calculate volume would be beneficial to the students.

**Budget Justification** (What resources are necessary to improve student learning?)

Staff in the Learning Support Center able to conduct formal study groups in Math 204 students.

**Course: MAT 204**

**SLOA Data**

	SU 2010	FA 2010	SP 2011	SU 2011	FA 2011	SP 2012	SU 2012	FA 2012	SP 2013	FA 2013	SP 2014
# Active students	5	5	30	9	19	20	11	9	27	16	42
%W	0	20	0	0	5.3	10	0	11.1	4.5	0	4.8
*% walk-away Fs No final exam/grade = F										6.3	4.8
% Success (A,B,C)	80	80	100	77.8	56.3	90	80	42.9	90	75	59.5
Common Comprehensive Final Exam Score			72	71	69	67	72	52	49	**	**
Mean course grade	2.6	3.25	3.76	2.33	2.07	3.36				2.5	1.93
Item Analysis <b>Weakest Content Areas</b>			SLO 3	SLO 3	SLO 3	SLO 3	None	SLO 1, 2 & 3	SLO 1, 2 & 3	SLO 1 & 3	SLO 1 & 3

\*% Walk-away Fs = Did not take the final exam and received a grade of F.

\*\* Common Comprehensive Component of the Final Exam provided and analyzed on the COG.

**Course: MAT 204**

**SLOA Data**

	FA 2013	SP 2014	FA 2014	SP 2015	FA 2015	SP 2016	
# Active students	16	42	22	42	25	35	
%W	0	4.8	18.2	7.1	16.0	8.6	
*% walk-away Fs No final exam/grade = F	6.3	4.8	13.6	11.3	8.0	11.4	
% Success (A,B,C)	75	59.5	50	54.8	48.0	65.7	
Common Comprehensive Final Exam Score	**	**	**	**	**	**	
Mean course grade	2.5	1.93	2.17	1.92	1.64	2.14	
Item Analysis <b>Weakest Content Areas</b>	SLO 1 & 3	SLO 1 & 3	none	SLO 1 & 3	SLO 1,3	SLO 1,2,3	

\*% Walk-away Fs = Did not take the final exam and received a grade of F.

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