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: Calculus II, Math 20**4** **Date:** Spring 2014

Course Team: Christopher J. Lewis, Larry Wadel

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 to tests to determine convergence/divergence of sequences and series. Students will also be able to represent functions by power series, determine intervals to 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

Assessment Question	1	2	3	4	5
Learning Outcome	1, 3	2, 3	2, 3	2	1, 3
HCC Mean	5.89	0.78	0.22	1.00	4.67
AP Mean	5.51	0.30	0.56	0.75	4.75
HCC Mean minus AP Mean	+0.38	+0.48	-0.34	+0.25	-0.08

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 of possible improvement, as indicated by the score on question 3, is outcome 3, utility, applying formulas to solve problems. This is particularly true of learning outcome 1.

Math 204-02

Assessment Question	1	2	3	4	5
Learning Outcome	1, 3	2, 3	2, 3	2	1, 3
HCC Mean	3.10	0.90	0.50	0.60	5.70
AP Mean	5.51	0.30	0.56	0.75	4.75
HCC Mean minus AP Mean	-2.41	+0.60	-0.06	-0.15	+0.95

The results indicate that HCC Math 204-02 students were not able to achieve all learning outcomes as compared to AP Calculus BC test examinees. This is particularly true of learning outcome 1. Many students scored 0 on question 1 indicating that they lacked technical

proficiency. The HCC mean was near or above the AP mean for questions testing learning outcomes 2 and 3.

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

The results from Math 204-01 indicate perhaps more work with applying formulas, especially those from Taylor series.

The results from Math 204-02 indicate that early intervention is needed, perhaps with formal study groups in the Learning Support Center, so that students at least acquire technical proficiency.

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.