2006

KANSAS CORE OUTCOMES PROJECT

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DRAFT

REPORT FOR SYSTEM COUNCIL OF
CHIEF ACADEMIC OFFICERS
PREPARED BY
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BACKGROUND

The Kansas Core Outcomes Project was initiated in 1999 by the Kansas Council of Instructional Administrators, a group comprised of the chief academic officers of the state's community college and vocational-technical schools/colleges. The goal of this project was to develop core outcomes and competencies for general education courses at the state's colleges and universities.

The first meeting for the project was held in fall 1999 at the Southside Educational Center in Wichita. Faculty were invited to that meeting from the state's 19 public community colleges, six Regents' universities and Washburn University and represented six disciplines – biology, computer science, English, mathematics, sociology, and speech. A second meeting, in spring 2000, was conducted at Emporia State University, and three additional disciplines – history, chemistry, and psychology – were added to that initial group of six. A third meeting, again at Southside, was conducted in January 2001. Another meeting of the core competency groups was held in September of 2002. In addition, disciplines such as English, speech and mathematics have scheduled other, independent meetings subsequently.

The Core Competency meetings were originally financed through the KCIA budget. Each institution made a commitment to their faculty and supplied them with finances for lunch and travel. Due to increased budget decreases and the time commitment for our faculty, it was decided that the meetings would be held annually in the fall semester in the coming years.

On September 15, 2006, approximately 175 faculty members gathered at the Southside Educational Center once again to review and reevaluate the competencies previously selected in specific core general education courses. Disciplines meeting this year included: biology, computer science, English, mathematics, sociology, anthropology, early childhood education, and art.

For a more complete history and documentation of the core outcomes project, see the Fall 2005 report, available at:

http://www.kansasregents.org/download/aca_affairs/corereport2005.pdf

MATH

MARK WHISLER, CLOUD COUNTY, AND JACK PORTER, UNIVERSITY OF KANSAS, FACILITATORS

Representatives from the University of Kansas, Kansas State University, Fort Hays State University, Wichita State University, Washburn University, and at least 11 community colleges met on September 15, 2006 at the Southside Education Center in Wichita.

Dr. Jack Porter, University of Kansas, presided over the meeting.

After initial announcements, a short discussion was held over whether schools were having difficulty with maintaining trigonometry as a prerequisite for an engineering calculus course. The general consensus seemed to be that this was not an issue. Discussion then shifted to a variety of topics, from the fact that some schools were no longer offering Pre-Calculus to placement exams that were being used and a general concern over standards.

The discussion then turned to the main topic of the day: competencies for a first semester science and engineering calculus course. A proposed list of competencies from the 2005 meeting was displayed for the purposes of the discussion. There was a short discussion about whether epsilon-delta proofs were needed. The consensus seemed to be that at least simple proofs of this type were needed.

Discussion of other topics proceeded, and changes were made to the proposed competencies, as detailed below. Most changes were minor in nature. But some major additions were made. One is that students should be able to find limits using L'Hopital's rule, and that students should be able to compute areas and volumes using shell and disk methods. In the same competency, it is also expected that they should also be able to compute arc lengths, be able to use the mean value theorem for integrals, and compute the average value of a function over an interval.

At this point the discussion turned to where competencies for a first semester course should stop and where a second semester's competencies should begin. Some representatives feel that the proposed competencies go too far, and that understanding is being compromised for coverage, while other representatives feel that anything less than the proposed competencies is unacceptable for giving transfer credit. In the end, the competencies listed below were proposed for discussion and review over the next year, and we will revisit this list in 2007.

(see next page)

Content Outline & Competencies for Engineering Calculus I:

I. Using Limits
- A. Evaluation of limits
  1. Evaluate the limit of a function at a point both algebraically and graphically.
  2. Evaluate the limit of a function at infinity both algebraically and graphically.
  3. Use the definition of a limit to verify a value for the limit of a function.
- B. Use of limits
  1. Use the limit to determine the continuity of a function.
  2. Apply the Intermediate-Value Theorem.
  3. Use the limit to determine differentiability of a function.
- C. Limiting process
  1. Use the limiting process to find the derivative of a function.

II. Finding Derivatives
- A. Find derivatives involving powers, exponents, and sums.
- B. Find derivatives involving products and quotients.
- C. Find derivatives involving the chain rule.
- D. Find derivatives involving exponential, logarithmic and trigonometric functions .
- E. Find derivatives involving hyperbolic and inverse trigonometric functions *.
- F. Find derivatives involving implicit differentiation.
- G. Use the derivative to find velocity, acceleration, and other rates of change.
- H. Use the derivative to find the equation of a line tangent to a curve at a given point.

III. Using Derivatives
- A. Curve sketching
  1. Use the first derivative to find critical points.
  2. Apply the Mean-Value Theorem for derivatives.
  3. Determine the behavior of a function using the first derivative.
  4. Use the second derivative to find inflection points.
  5. Determine the concavity of a function using the second derivative.
  6. Sketch the graph of the function using information gathered from the first and second derivatives.
  7. Interpret graphs of functions.
- B. Applications of the derivative
  1. Use optimization techniques in areas such as economics, the life sciences, the physical sciences, and geometry.
  2. Solve related rates problems.
  3. Use Newton's Method.
  4. Use differentials to estimate change.
  5. Find limits using L'Hopital's Rule.*

IV. Finding Integrals
- A. Find area using Riemann sums and integrals.
- B. Express the limit of a Riemann sum as a definite integral.
- C. Evaluate the definite integral using geometry.
- D. Integrate algebraic, exponential*, and trigonometric functions.
- E. Evaluate definite integrals using the Fundamental Theorem of Calculus.
- F. Apply the Mean-Value Theorem for integrals.

G. Integrate indefinite integrals.
H. Integrate using substitution.
I. Integrate using numerical techniques.
J. Integrate using integration by parts and trigonometric substitutions*
K. Evaluate improper integrals*

V. Using the Integral
A. Solve a differential equation by separation of variables.*
B. Solve initial value problems.*
C. Solve applications of exponential increase and decrease.*
D. Compute areas and volumes using shell and disk methods. Compute arc lengths and the average value of a function.*
E. Applications to physics, engineering, and geometry (solid figures)*

* = some Regent's Universities require these topics for transfer credit

MATHEMATICS PARTICIPANTS IN KANSAS CORE OUTCOMES MEETING, SEPTEMBER 16, 2006

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