COURSE OUTLINE
Calculus 2 with Analytic Geometry

Course Description
MA 152. Calculus 2 with Analytic Geometry. 5 hours credit. Prerequisite: MA 151 with a C or better. This course will enable the student to understand applications and methods of integration, improper integrals, convergence and divergence of infinite series, graphs of conic sections, the polar coordinate system, parametric equations, vectors, and the geometry of space.

Required Materials
For complete material(s) information, refer to https://bookstore.butlercc.edu

Butler-Assessed Outcomes
The intention is for the student to be able to
1. Use methods of calculus to solve real-world, physical problems
2. Explore advanced integration techniques
3. Determine convergence or divergence of a sequence or series
4. Connect analytic and geometric concepts
5. Explore vectors and the geometry of space.

Learning PACT Skills that will be developed and documented in this course
Through involvement in this course, the student will develop ability in the following PACT skill area(s):

Analytical Thinking Skills
- Problem solving – Through the solution of multi-step calculus scenarios, the student will develop increased ability to analyze and solve problems.
- Critical thinking – Through the formation of mathematical models, the student will develop solutions to real-world situations.

Technology Skills
- Discipline-specific technology – Through the use of the graphing calculator, the student will develop skills in using this math tool for mathematical problems.

Major Summative Assessment Task(s)
These Butler-assessed Learning Outcomes and the Learning PACT skills will be demonstrated by:
1. Solving problems (A skill) involving the course-specific concepts of calculus including those that involve physical applications (T skill) that synthesize (A skill) the material covered in the class.

Skills or Competencies
These actions are essential to achieve the course outcomes:
1. Use definite integrals to solve applied problems in geometry, science and engineering
2. Evaluate integrals using appropriate integration techniques
3. Analyze infinite sequences and series for convergence or divergence
4. Apply the concepts of calculus to analytic geometry
5. Apply the concepts calculus to three dimensions

Learning Units
I. Applications of integration
   A. Area of a region between two curves
   B. Volume: the disk method
   C. Volume: the shell method
   D. Arc length and surfaces of revolution (surfaces of revolution is optional)
   E. Work (optional)
   F. Moments, centers of mass, and centroids (optional)
   G. Fluid pressure and fluid force (optional)

II. Integration techniques and improper integrals
   A. Basic integration rules
   B. Integration by parts
   C. Trigonometric integrals
   D. Trigonometric substitution
   E. Partial fractions
   F. Numerical integration
   G. Integration by tables and other integration techniques
   H. Improper integrals

III. Infinite series
   A. Sequences
   B. Series and convergence
   C. The integral test and $p$-series
   D. Comparisons of series
   E. Alternating series
   F. The ratio and root tests
   G. Taylor polynomials and approximations
   H. Power series
   I. Representation of functions by power series
   J. Taylor and Maclaurin series

IV. Conics, parametric equations, and polar coordinates
   A. Conics and calculus
   B. Plane curves and parametric equations
   C. Parametric curves and calculus
   D. Polar coordinates and polar graphs
E. Area and arc length in polar coordinates (arc length is optional)

V. Vectors and the geometry of space
   A. Vectors in the plane
   B. Space coordinates and vectors in space
   C. The dot product of vectors
   D. The cross product of vectors in space
   E. Lines and planes in space (optional)
   F. Surfaces in space (optional)

Learning Activities
Learning activities will be assigned to assist the student to achieve the intended learning outcome(s) through lecture, instructor-led class discussion, guest speakers, group activities, drills/skill practice, and other activities at the discretion of the instructor.

Grade Determination
The student will be graded on learning activities and assessment tasks. Grade determinants may include the following: daily work, quizzes, chapter or unit tests, comprehensive examinations, projects, presentations, class participation, and other methods of evaluation at the discretion of the instructor.