Course Outline for Mathematics 1

CALCULUS I

Catalog Description:

MTH 1 - Calculus I 5.00 units
Elements of analytic geometry, derivatives, limits and continuity, differentiation of algebraic and trigonometric functions, the definite integral.
Prerequisite: MTH 20 (completed with a grade of "C" or higher) or an appropriate skill level demonstrated through the mathematics assessment process.

Grading Option: Letter Grade

Discipline:

<table>
<thead>
<tr>
<th>Type</th>
<th>Units</th>
<th>Inside of Class Hours</th>
<th>Outside of Class Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>5</td>
<td>90.00</td>
<td>180.00</td>
</tr>
<tr>
<td>Laboratory</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Clinical</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Work Exp (Non-Paid)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Work Exp (Paid)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No Unit Value Lab</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5.00</td>
<td>90.00</td>
<td>180.00</td>
</tr>
</tbody>
</table>

Prerequisite Skills:
None

Measurable Objectives:

Upon completion of this course, the student should be able to:

1. use delta notation;
2. explain limits and continuity;
3. find the limit of a function at a real number;
4. determine if a function is continuous at a real number;
5. use Newton’s method;
6. apply the definition of the derivative of a function;
7. find the equation of a tangent line to a curve;
8. define velocity and acceleration in terms of mathematics;
9. differentiate algebraic and trigonometric functions using differentiation formulas;
10. find all maxima, minima, and points of inflection on an interval;
11. sketch the graph of a differentiable function;
12. use differentiation to solve optimization problems;
13. apply implicit differentiation to solve related rate problems;
14. apply the Mean Value Theorem;
15. find the value of a definite integral as the limit of a Riemann sum;
16. integrate a definite integral using the Fundamental Theorem of Integral Calculus;
17. find areas using the definite integral;
18. find differentials and use differentials to solve applications;
19. differentiate appropriate functions using the Fundamental Theorem of Integral Calculus;
20. find the volume of a solid of revolution using the shell, disc, washer methods;
21. integrate using the substitution method;
22. find the volume of a solid by slicing;
23. determine the average value of a function.

Course Content:

1. Review relations, functions and graphs
2. Review lines, equations and slopes
3. Limits and continuity using graphical, numerical and algebraic approaches
4. Definition of a derivative as a limit
5. Mean Value Theorem
6. Interpretation of a derivative
   A. Slope of a tangent line
   B. Rate of change
7. Differentials and their applications
8. Differentiation of algebraic functions
9. Differentiation of trigonometric functions
10. Differentiation rules including the chain rule
11. Implicit differentiation
12. Differentiation of inverse functions
13. Higher order derivatives
14. Maxima, minima and points of inflection
15. Curve sketching
16. Applications of differentiation
   A. Related rates
   B. Optimization
17. Newton’s Method
18. Antiderivatives
19. Riemann sum
20. Definite integral and the Fundamental Theorem of Integral Calculus
21. Mean Value Theorem for Definite Integrals
22. Average value of a function
23. Integration by substitution
24. Areas of plane regions
25. Volume of solids of revolutions
26. Volume of solid by slicing

Methods of Presentation
1. Lecture/Discussion
2. Audio-visual materials
3. Computer-based interactive curriculum
4. Group Activities
5. Problem Solving
6. Textbook reading assignments

Assignments and Methods of Evaluating Student Progress
1. Typical Assignments
   A. Exercises from the textbook such as the following: Show, using implicit differentiation, that any tangent line at a point P to a circle with center O is perpendicular to the radius OP.
   B. Collaborative: Given a variety of functions, differentiate the functions.
2. Methods of Evaluating Student Progress
   A. Exams/Tests
   B. Quizzes
   C. Class Participation
   D. Home Work
   E. Final Examination
3. Student Learning Outcomes
   Upon the completion of this course, the student should be able to:
   A. Critically analyze mathematical problems using a logical methodology.
   B. Communicate mathematical ideas, understand definitions, and interpret concepts.
   C. Increase confidence in understanding mathematical concepts, communicating ideas and thinking analytically.

Textbook (Typical):

Special Student Materials
1. A scientific or graphing calculator may be required.
2. Access code to a software learning system may be required.

Abbreviated Class Schedule Description:

Elements of analytic geometry, derivatives, limits and continuity, differentiation of algebraic and trigonometric functions, the definite integral.

Prerequisite: MTH 20 (completed with a grade of “C” or higher) or an appropriate skill level demonstrated through the mathematics assessment process.