**College of Science and Health
Department of Mathematics
Course Outline**

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| **1.** | **Title of Course, Course Number and Credits**:Elementary Function Theory - MAEN 5060,  3 credits |
| **2.** | **Description of Course:**This course presents an introduction to the theory of algebraic, exponential, logarithmic, and trigonometric functions with graphical analysis and applications. A graphing calculator is used throughout the course to explore the relationships between functions. Other technology used will be a computer algebra system with related Internet plug-ins so that interactive web learning working with functions can be explored. |
| **3.** | **Course Prerequisites**:The prerequisites for this course are [MAEN 502](http://www.wpunj.edu/cos/math/outlines/maen502.htm)0 or knowledge of algebra. |
| **4.** | **Course Objectives:**  1. To understand the theory of elementary functions (algebraic, exponential, logarithmic, and trigonometric functions)
2. To understand the theory of graphing functions and their zeros
3. To gain the ability to visualize the graph of a given function and to understand how the graph changes as the parameters of the function vary
4. To develop relationships between the types of functions with Order of Growth
5. To explore the effect of technology in the learning and doing of mathematics
6. To develop a portfolio of modern functions theory applications.
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| **5.** | **Student Learning Outcomes. Students will be able to:**1. Understand the properties of the elementary functions
2. Apply the elementary functions to a variety of "real-world" problems
3. Understand and analyze different function models for the same problem
4. Use a variety of technology to obtain real-world data, such as graphing calculators, CBL's, probes, etc.
5. Work with different Internet capabilities such as Live-Math plug-in, JavaScript applications, applets, movies to explore learning with the Internet
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| **6.** | **Topical Outline of the Course Content**:

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|  | Definition of Functions, Function Notation, Domain and Range |
|  | Types of Functions, Concavity, Increasing, and Decreasing Functions |
|  | Linear Functions and their graphs with Applications |
|  | Theory of Polynomial Functions and their Zeros and Graphs |
|  | Rational and Algebraic Functions |
|  | Exponential and Logarithmic Functions |
|  | Transformations of Functions |
|  | Trigonometric Functions |
|  | Composite, Inverse, and Combination Functions |
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| **7.** | **Guidelines/Suggestions for Teaching Methods and Student Learning Activities**:Course is being offered on-line. Each week includes readings, exercises, discussion postings and some interactive internet on-line learning opportunity  |
| **8.** | **Guidelines/Suggestions for Methods of Student Assessment (Student Learning Outcomes)**Students will have:1. Fourteen (14) Weekly homework assignments demonstrating knowledge of function theory (60%)
2. Project showing the development of an application appropriate to your classroom using an aspect of function theory along with the technology used (and commands) and necessary worksheets OR a 3 page paper on one of the reform developments in teaching PreCalculus. (10%)For the paper, visit The North Carolina School of Science and Mathematics - Teaching Contemporary Mathematics Conference,(http://phywww1.ncssm.edu/green/math/tcmconf/talks2000.html)or NCTM's Principles and Standards for School Mathematics - with examples, lesson plans and resources linked to the standards.(http://standards.nctm.org/)or PreCalculus Reform at the University of Michigan(http://www.math.lsa.umich.edu/programs/calculus/pcpost93.html)or Functioning in the Real World: A PreCalculus Experience: The Math Modeling/Precalculus Reform Project(http://www.amatyc.org/Proceedings/Atlanta23/Gordon/HTML/Gordon.html)
3. A minimum of 8 Postings to the discussion forum (10%)
4. Final Exam (20%)
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| **9.** | **Suggested Reading, Texts and Objects of Study**:Connally, Hughes-Hallett, Gleason, et al., Functions Modeling Change. New York, John Wiley & Sons, Inc. 2000, ISBN# 0-471-17084-4 |
| **10.** | **Bibliography of Supportive Texts and Other Materials**:**Websites**

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|  | Calculators - several types for different purposes(http://www.math.com) |
|  | Several Graphing Plotters are available for you on the Internet: Here are some of them:Graphing Plotter(http://www.garrink.com/java/graph/)Java Applets for graphing!!!(http://math.hws.edu/javamath/)Two Graphing Plotters(http://www.math.com) |
|  | Calculus@Internet's PreCalculus site - links, examples, history, practice area, "How do you?" section and "Ask Someone" section(http://www.calculus.net/ci2/search/?request=category&code=11&off=0&tag=9200438920658) |
|  | Functioning in the Real World: A PreCalculus Experience: The Math Modeling/Precalculus Reform Project(http://www.amatyc.org/Proceedings/Atlanta23/Gordon/HTML/Gordon.html) |
|  | Homeworkhelp.com List of Precalculus Topics(http://www.homeworkhelp.com/homeworkhelp/freemember/text/math/high/htopic02.htm)with their Complete Site on Trigonometry(http://www.homeworkhelp.com/homeworkhelp/freemember/text/math/high/htopic05.htm) |
|  | MathView Notebooks on PreCalculus and Trigonometry(http://www.lee.edu/~shamby/mvlist.html) |
|  | NCTM's Principles and Standards for School Mathematics - with examples, lesson plans and resources linked to the standards.(http://standards.nctm.org/) |
|  | NCTM's Electronic Examples - Internet activities matched with the standards at all grade levels(http://standards.nctm.org/document/eexamples/index.htm) |
|  | The North Carolina School of Science and Mathematics - Teaching Contemporary Mathematics Conference, February 11 & 12, 2000, Links to Talks, Papers(http://phywww1.ncssm.edu/green/math/tcmconf/talks2000.html) |
|  | PreCalculus Algebra TI-83 Tutorial Website - provides instruction on the specific capabilities of the TI-83 or TI-83 Plus that are necessary for a Precalculus and/or Algebra Class(http://www.titutorials.com/algb83/mainpage.htm) |
|  | PreCalculus Course, Spring 2000(http://www.mathnstuff.com/math/one27/precalc.htm) |
|  | PreCalculus list of Web Resources(http://www.langara.bc.ca/mathstats/resource/onWeb/rawlist.htm#PrecalcCourses)  |
|  | PreCalculus ListServ - for Precalculus teachers on all aspects of teaching Precalculus ranging from student concerns like math anxiety and test anxiety, to student skills like study skills and problem solving, to the use of technology such as graphing calculators and curriculum and assessment concerns.(http://www.snunit.k12.il/list78.html) |
|  | Precalculus Reform at the University of Michigan(http://www.math.lsa.umich.edu/programs/calculus/pcpost93.html) |
|  | PreCalculus Web Site - with downloadable materials in WORD 2000 format(http://www.humboldt.edu/~dlj1/PreCalculus/PreCalculus.html) |
|  | Precalculus WebLet(http://oscar.ctc.edu/precalc/site\_map1.html) |
|  | Web Based Course in PreCalculus(http://www.langara.bc.ca/mathstats/resource/onWeb/Precalculus/index.htm)  |

 **Books**

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|  | Barnes, M. Families of Functions, Carlton,Victoria, Curriculum Corporation, 1991. |
|  | \_\_\_\_\_\_\_\_, Functions and Modeling. Carlton,Victoria, Curriculum Corporation, 1991. |
|  | \_\_\_\_\_\_\_\_, Growth and Decay. Carlton,Victoria, Curriculum Corporation, 1993. |
|  | Egsgard, J., G. Flewelling, C. Newall, and W. Warburton. Making Connections with Mathematics. Providence, RI, Janson Publications, Inc. 1988. |
|  | Fey, J. Y. and M. K. Heid. Concepts in Algebra: A Technological Approach. Providence, RI, Janson Publications, Inc. 1995. |
|  | Larson, R. E., R. P. Hostletler, & A. V. Hodgkins. College Algebra: Concepts and Models. Lexington, MA, D. C. Heath and Company, 1996. |
|  | North Carolina School of Science and Mathematics. Contemporary Precalculus through Applications: Functions, Data Analysis, and Matrices. Providence, RI, Janson Publications, Inc. 1991. |
|  | Serra, M. Mathercise: Classroom Warm-Up Exercises. Berkeley, CA. Key Curriculum Press, 1992 |
|  | Solow, A, ed. Preparing for a New Calculus, MAA Conference Proceedings, 1994 |

 **Journals**

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|  | Journal of Computers in Mathematics and Science TeachingAACEPO Box 2966Charlottesville, VA 22902website: <http://www.aace.org/>  |
|  | NCTM JournalsNCTM Headquarters1906 Association DriveReston, VA 20191-9988website: <http://www.nctm.org/>  |
|  | Journal for Research in Mathematics Education (JRME)<http://www.nctm.org/jrme/jrme.html>  |
|  | Mathematics Teaching in the Middle School (MTMS)<http://www.nctm.org/mtms/mtms.htm>  |
|  | Mathematics Teacher (MT)<http://www.nctm.org/mt/mt.htm>  |

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| **11.** | **Preparer’s Name and Date:**Dr. Diane Kalish, Fall 1999 |
| **12.** | **Original Department Approval Date:** |
| **13.** | **Reviser’s Name and Date**:Dr. Beva Eastman, Fall 2001 |
| **14.** | **Departmental Revision Approval Date**: |
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