

## SYLLABUS: ENGINEERING MATHEMATICS 1

**Date / Revision** 23 May 2015 / 02 May 2017 / PP  
**Faculty** Engineering & Lifesciences  
**Study Programs** AVE, MEE, INE, COS, ELE, MTE, FTE, CHE, BME

### SUBJECT: Engineering Mathematics 1

#### 1 Basic Information

<b>1.01</b>	<b>Subject Name</b>	<b>Engineering Mathematics 1</b>
<b>1.02</b>	<b>Semester</b>	1
<b>1.03</b>	<b>Level</b>	1
<b>1.04</b>	<b>SKS</b>	3
<b>1.05</b>	<b>Mandatory / Curriculum</b>	F-04
<b>1.06</b>	<b>Subject Code</b>	MATH
<b>1.07</b>	<b>Subject Code</b>	ENG-F-MATH-114
<b>1.08</b>	<b>Year</b>	2017 (7)
<b>1.09</b>	<b>Quality Control</b>	Final Test, see evaluation
<b>1.10</b>	<b>Limitations</b>	Min 12 and Max 32 students in one class
<b>1.11</b>	<b>Combined with</b>	AVE, AUE, COS, MEE, INE, ELE, MTE, FTE, CHE, BME
<b>1.12</b>	<b>Perquisite</b>	None
<b>1.13</b>	<b>Responsible</b>	Dean of Engineering Faculty and Dean of Lifesciences Faculty
<b>1.14</b>	<b>Revision</b>	15-05-2017/MaS

#### 2 Description of Subject

The course is designed to challenge students to further develop and extend their critical thinking skills by applying strategies which will help them interpret, analyze, evaluate, infer, and synthesize concepts studied in this course and develop greater knowledge and understanding of mathematics and to attain the skills necessary for success in the study of higher mathematics.

### 3 Objectives

- The objectives of the 1st Year Engineering Mathematics course are to ensure that students, whatever their mathematical background at entry, acquire the mathematical knowledge and skills required both for the 1st Year Engineering courses and for the more advanced mathematical techniques introduced and applied in the 2nd Year course.
- Impart relevant skills and knowledge for independent learning of other subjects that require such skills and knowledge.

### 4 Competency

After having the course, students are expected to:

- Evaluate the limits of a function as  $x$  approaches a value (or approaches positive/negative infinity) numerically, graphically, and analytically.
- Define and evaluate a function for Continuity, Compute the derivative of a function using the Limit Definition, Differentiate Algebraic, Trigonometric, Inverse Trigonometric, Exponential and Logarithmic functions using appropriate derivative rules such as; constant, power, product, quotient, and chain rules,
- Recognize Indeterminate forms when taking a limit and apply L'Hopital's Rule when appropriate; Calculate higher order derivatives;
- Evaluate the derivatives of implicit functions.; Apply derivatives to applications, such as; slope of a tangent line, velocity and acceleration, curve sketching, related rates problems, and optimization problems; State and apply the Intermediate Value Theorem, Rolle's Theorem, and the Mean Value Theorem;
- Calculate differentials and apply them to compute error propagation;
- Calculate Antiderivatives and Indefinite Integration;
- Calculate series expansion of functions and apply series concept in engineering problems.

### 5 Learning Approach / Methodology

- Lectures/ Class contact (time-tabled) supplemented with interactive questions and answers;
- Circuit simulation using Electronic Workbench Software;
- Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing;
- Student Study Effort: homework/assignment; preparation for test/quizzes/ examination.

### 6 Evaluation

5.1	<b>Absence maximum</b>	25%
5.2	<b>Participation in Discussion</b>	05 Points
5.3	<b>Homework / Classwork</b>	05 Points
5.4	<b>Presentation /Simulation</b>	10 Poin
5.5	<b>Daily Quiz</b>	20 Points
5.6	<b>Final Examination</b>	60 Points
	<b>Total</b>	100 Points

**7 Text Book and Reference**

<b>1</b>	<b>Main Text Book:</b> “Calculus: Early Transcendental Functions”, <b>Author:</b> Robert T. Smith Roland Minton, <b>Publisher:</b> McGraw Hill – Higher Education; <b>ISBN:</b> 0 07353232 0.
<b>2</b>	<b>Supplement Textbooks:</b> <ul style="list-style-type: none"> <li>• “Advanced Engineering Mathematics, 10<sup>th</sup>_Edition”, <b>Author:</b> Erwin Kreyzig, <b>Publisher:</b> John Wiley, <b>ISBN:</b> 978-0-470-45836-5</li> <li>• “Mathematik fuer Ingenieur Und Naturwissenschatler, Band 2”, <b>Author:</b> Lothar Popula, <b>Publisher:</b> Viewegs Fachbuecher der Technik, <b>ISBN:</b>978-3-8348-0304-7</li> </ul>

**8 Content / Topics of Lecture**

Week	Content/ Topics of Lecturing	Text Book	Remark
1-2	<b>Preliminaries / Review of Algebra:</b> <ul style="list-style-type: none"> <li>• Polynomials and Rational Functions</li> <li>• Graphing Calculators and Computer Algebra Systems</li> <li>• Inverse Functions</li> <li>• Trigonometric and Inverse Trigonometric Functions</li> <li>• Exponential and Logarithmic Functions</li> <li>• Transformation of Functions</li> </ul>	Ch01	
3-4	<b>Limits and Continuity:</b> <ul style="list-style-type: none"> <li>• A brief Preview of Calculus: Tangent Lines and the Length of a Curve</li> <li>• The concept of Limits</li> <li>• Computation of Limits</li> <li>• Continuity and its Consequences</li> <li>• Limit involving Infinity; Asymptotes</li> <li>• Formal definition of limit</li> <li>• Limit and Loss-of-Significance Errors</li> </ul>	Ch2	Quiz
5-6	<b>Differentiation:</b> <ul style="list-style-type: none"> <li>• Tangent Lines and Velocity</li> <li>• The derivative</li> <li>• Computation of Derivatives: The Power Rule</li> <li>• The Product and Quotient Rules</li> <li>• The Chain Rule</li> <li>• Derivatives of Trigonometric Functions</li> <li>• Derivatives of Exponential and Logarithmic Functions</li> <li>• Implicit Differentiation and Inverse Trigonometric Functions</li> <li>• The Hyperbolic Functions</li> <li>• The Mean Value Theorem</li> </ul>	Ch2	Quiz

7	<b>Application of Derivative:</b> <ul style="list-style-type: none"> <li>• Linear Approximations and Newton's Method</li> <li>• Indeterminate Forms and L'Hopital's Rule</li> <li>• Maximum and Minimum Values</li> <li>• Increasing and Decreasing Functions</li> <li>• Concavity and the Second Derivative Test</li> <li>• Overview of Curve Sketching</li> <li>• Optimization</li> <li>• Related Rates</li> <li>• Rates of Change in Economics and the Sciences</li> </ul>	Ch3	
8	<b>MIDTERM SEMESTER BREAK</b>		
9-10	<b>Integration:</b> <ul style="list-style-type: none"> <li>• Reading and writing – great ideas</li> <li>• Antiderivatives</li> <li>• Sums and Sigma Notation</li> <li>• Area</li> <li>• The Definite Integral</li> <li>• The Fundamental Theorem of Calculus</li> <li>• Integration by Substitution</li> <li>• Numerical Integration</li> <li>• The Natural Logarithm as an Integral</li> </ul>	Ch4	Quiz
11	<b>Application of the Definite Integral:</b> <ul style="list-style-type: none"> <li>• Reading and writing – career change</li> <li>• Area Between Curves</li> <li>• Volume: Slicing, Disks and Washers</li> <li>• Volumes by Cylindrical Shells</li> <li>• Arc Length and Surface Area</li> <li>• Projectile Motion</li> <li>• Applications of Integration to Physics and Engineering</li> <li>• Probability</li> </ul>	Ch5	
12-13	<b>Integration Techniques:</b> <ul style="list-style-type: none"> <li>• Reading and writing – corporate entertaining</li> <li>• Review of Formulas and Techniques</li> <li>• Integration by Parts</li> <li>• Trigonometric Techniques of Integration</li> <li>• Integration of Rational Functions Using Partial Fractions</li> <li>• Integration Tables and Computer Algebra Systems</li> <li>• Improper Integrals</li> </ul>	Ch6	Quiz
14-15	<b>Complex Number:</b> <ul style="list-style-type: none"> <li>• Complex Number and their geometric representation</li> <li>• Complex numbers and Function, Complex differentiation</li> <li>• Polar form of Complex Numbers, Powers and Roots</li> <li>• Derivative, Analytic Function</li> </ul>	Ch9	
16	<b>Final Examination</b>		