

Department of Mathematics  
**Johns Hopkins University**

# **110.108 Calculus I (Phys. Sci. & Eng.)**

## **Course Syllabus**

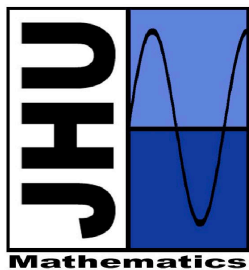
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The following list of topics is considered the core content for the course 110.108 Calculus I (Physical Sciences and Engineering). The current text for the course is:

**Text:** [Single Variable Calculus: Early Transcendentals](#), 6<sup>th</sup> Edition, James Stewart, ISBN-10: 0-495-01169-X ISBN-13: 978-0-495-01169-9

### Course Topics

- **Review basic properties of Functions (1- weeks)**
  - Chapter 1
- **Limits (1+ weeks)**
  - 2.1 The Tangent and Velocity Problem
  - 2.2 The Limit of a Function
  - 2.3 Calculating Limits Using the Limit Laws
  - 2.4 The Precise Definition of limit
  - 2.5 Continuity
  - 2.6 Limits at Infinity: Horizontal Asymptotes
- **Derivatives (5- weeks)**
  - 2.7 Derivatives and Rates of Change
  - 2.8 The Derivative of a Function
  - 3.1 Derivatives of Polynomial and Exponential Functions
  - 3.2 The Product and Quotient Rules
  - 3.3 Derivatives of Trigonometric Functions
  - 3.4 The Chain Rule
  - 3.5 Implicit Differentiation
  - 3.6 Derivatives of Logarithmic Functions
  - 3.9 Related Rates
  - 3.10 Linear Approximations and Differentials
  - [Optional] 3.11 Hyperbolic Functions
- **Applications of the Derivative (2 weeks)**
  - 4.1 Maximum and Minimum Values
  - 4.2 The Mean value Theorem
  - 4.3 How Derivatives Affect the Shape of a Graph
  - 4.4 Intermediate Forms and L'Hospital's Rule
  - 4.7 Optimization Problems
  - [Optional] 4.8 Newton's Method
- **Integration (2 weeks)**
  - 4.9 Antiderivatives
  - 5.1 Areas and Distances
  - 5.2 The Definite Integral
  - 5.3 The Fundamental Theorem of Calculus
  - 5.4 Indefinite Integrals and the Net Change Theorem
  - 5.5 The Substitution Rule



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- **Applications of the Integral (1+ week)**
  - 6.1 Areas between Curves
  - 6.2 Volumes
  - 6.3 Volumes of Cylindrical Solids
  - 6.5 Average Value of a Function
  - 8.1 Arc Length
  - 8.2 Area of a surface of Revolution