# **RBOT 101 – Foundations – Course Outline (10 weeks)**

1. Pre-course assessment
2. Linear algebra
   1. Matrix manipulation
      1. Basic arithmetic operations (+, -, \*, /), identity
      2. Determinant, trace
      3. Inversion, commutativity
   2. Linear systems
      1. Basis vectors
      2. Solution of linear systems of equations
   3. Geometric transformations
      1. Coordinate system transformations
      2. Translations and rotations
      3. Alternative approaches
         1. Euler angles
         2. Quaternions
3. Calculus
   1. Limits/Continuity
   2. Differentiation
      1. Geometric interpretation – lead to discussion on numerical approaches to differentiation
      2. Rules for differentiation
   3. Integration
      1. Geometric interpretation – lead to discussion on numerical approaches to integration
      2. Indefinite/Definite Integrals
      3. Integration techniques
4. Differential Equations
   1. Categories of Diff Equations
      1. Ordinary
      2. Partial
      3. Linear/Non-linear
      4. Different orders
   2. Methods of solution for different categories – look at most commonly used methods
5. Graph theory and Complexity
   1. Graphs
   2. Algorithms on graphs
      1. Cuts
      2. Flow
      3. Paths
   3. Complexity
      1. Time
      2. Space
6. Probability and Statistics
   1. Probabilistic models
   2. Linear least squares
   3. Bayesian models
   4. Markov processes
7. Optimization
8. Post-course assessment