

## MAT 215

### Course Contents

1. Complex Numbers: Basic algebraic properties, modulus & argument, polar & exponential form, Euler's formula, De Moivre's theorem & application.
2. General functions of a complex variable. Limits and continuity of a function of complex variables and related theorems.
3. Complex differentiation and Cauchy-Riemann equations. Harmonic functions
4. Exponential, Trigonometric, Hyperbolic, Logarithmic functions.
5. Line integral of a complex function. Contour integration.
6. Cauchy's integral theorem. Cauchy's integral formula.
7. Laplace transforms of some elementary functions. Inverse Laplace transforms.
8. Laplace transforms of derivatives—solutions of differential equations by Laplace transformations.
9. The Unit Step Function & its application.
10. Machine Learning: Linear Regression, Gradient & Steepest Decent, Lagrange Multiplier for understanding Support Vector Machine.

### Midterm:

1. Complex Numbers: Basic algebraic properties, modulus & argument, polar & exponential form, Euler's formula, De Moivre's theorem & application.
2. General functions of a complex variable. Limits and continuity of a function of complex variables and related theorems.
3. Complex differentiation and Cauchy-Riemann equations. Harmonic functions
4. Exponential, Trigonometric, Hyperbolic, Logarithmic functions.

### Final:

1. Line integral of a complex function. Contour integration.
2. Cauchy's integral theorem. Cauchy's integral formula.
3. Cauchy's Residue Theorem
4. Laplace transforms of some elementary functions. Inverse Laplace transforms.
5. Laplace transforms of derivatives—solutions of differential equations by Laplace transformations.
6. The Unit Step Function & its application.

### References:

1. Schaum's Outlines Complex Variables (2nd Ed.) by Spiegel, Lipschutz, Schiller, Spellman.
2. Complex Variables and Applications (8th Ed.) by Brown and Churchill.
3. Schaum's Outlines Laplace Transformations by Spiegel.
4. Differential Equations with boundary Value problems (7<sup>th</sup> Ed.) by Dennis G. Zill and Michael R. Cullen
5. Mathematics for Machine Learning by **Deisenroth, Faisal, Ong**.