University of Moratuwa, Faculty of Engineering, Department of Mathematics-20160503
BSc Engineering Honors Degree
Semester 3(14 batch): 2016/02/01-2016/05/27-15 weeks, Reading Week-2016/04/08-2016/04/24
CS(125)-Thu 13.15: 15.15-ASSH

Lecturer: Dr. Udaya Chinthaka Jayatilake
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Module Code	**MA2073**	**Title**	**Calculus for System Modelling**			
Credits	**02**	**Hours/ Week**	**Lectures**	**02**	**Pre-requisites**	**MA1013**
			Lab/Tutorials	**-**		

Learning Outcomes

At the end of this module the student should be able to

- Perform vector differentiation and integration and evaluate vector and scalar quantities in various engineering applications.
- Perform contour integration techniques.
- Apply conformal mapping in physical system modeling.
- Use probability distributions for various decision making in engineering.

Outline Syllabus

Vector Calculus

- Multivariable functions, partial differentiation, chain rule, directional derivatives,
- Maxima and minima, Lagrange multipliers.
- Taylor series expansion of multivariate functions.
- Double Integral, triple integral, vector functions;
- Introduction to vector calculus. Vector differentiation and differential operators, space curves and line integral, surface integrals.

Complex Variables

- Taylor and Laurent's series, contour integration.
- Introduction to conformal mapping.

Basic Probability and Statistics

- Properties of random variables.
- Statistical distributions.
- Applications involving Binomial, Poisson, Normal and Exponential distributions.

Method of Assessment

End of semester examination: 2 hour closes book paper: 70%

Mid semester examination: 1 hour open book paper: 10%

In-class assessments: 12%

Take-home assessment: 8%

References

- Advanced Calculus, David V. Widder
- Calculus: Volume I & II, Tom M. Apostol
- Mathematical Analysis, Tom M. Apostol
- Advanced Engineering Mathematics, Michael D. Greenberg
- Complex Variables: Introduction and Applications- Cambridge Texts in Applied Mathematics, Mark J. Ablowitz and Athanassios S. Fokas .
- http://www.wolframalpha.com/
- http://mathworld.wolfram.com/
- General Theory of Relativity, S. P. Puri
- Gravity- an Introduction to Einstein's General Relativity, James B. Hartle

Detailed Syllabus

Vector Functions of One Variable, Differentiation, Length of a curve, Tangent Vector, Curvature, Normal Vector, Binormal Vector, Torsion, Frenet-Serret Formuls, Vector Functions of Several Variables, Grad Curl Divergence and Relations, Line Element, Line Integrals, Path Independence, Conservative and Irrotational Vector Fields, Exact Differentials, Scalar Potential, Surface Area, Surface Element, Surface Integrals, Curvilinear Coordinates, Green's Theorem, Stokes Theorem, Volume Element, Volume Integrals, Divergence Theorem, Solenoidal Vector Fields
Analytic Function, Cauchy Riemann Equations, Entire and Harmonic Functions, Simply Connected Doubly Connected and Multiply Connected Regions, Cauchy Integral Formula, Taylor Series, Laurent Series, Singular Points, Poles Essential and Removable Singularities, Residues, Cauchy Residue Theorem, Conformal Mapping