King Fahd University of Petroleum and Minerals

Department of Mathematics

Math 528 Syllabus, Term 221

Instructor: Dr. Jaecheon Joo

The Course Code and Name: Math 528, Mathematics for Visual Computing

The Course Credit Hours: 3-0-3

The Course Objective: The aim of this course is to provide students fundamental ideas of geometry as well as basic Mathematics that are indispensable for Visual Computing.

The Course Content:

- Rudiments of linear algebra: Matrices and vector spaces, Eigenvalues, Eigenvectors, LU decomposition
- Differential geometry of curves: Parametrized curves, Regular curves, Arc-length, Curvature and torsion, Frenet-Serret equations
- Discrete differential geometry of curves: Discrete curves, Curvature and torsion of discrete curves
- Differential geometry of surfaces: Normal, principal and Gauss curvature, Geodesics
- Discrete differential geometry of surfaces: Curvature in triangle meshes, lines of curvature in meshes
- Mesh processing: Laplacian and Taubin smoothing
- Convex and non-convex optimization

The Course Prerequisite: Calculus Courses, Linear Algebra

The Grading Policy: Homeworks (30%), Midterm Exam (30%), Final Exam (40%)

Dates of Exams: Will be discussed in the class.

Textbook(s)

1. M. do Carma, "Differential geometry of curves and surfaces" 2nd ed.
2. Bærentzen, J. Andreas, et al. *Guide to computational geometry processing: foundations, algorithms, and methods*. Springer Science & Business Media, 2012.
3. Nocedal, Jorge, and Stephen Wright. *Numerical optimization*. Springer Science & Business Media, 2006.