MATH 6702: DIFFERENTIAL GEOMETRY

- Riemannian manifolds
  (1) Differentiable manifolds
  (2) Tangent and cotangent bundles
  (3) Riemannian metrics
  (4) Volume elements and integrals
  (5) Gradients
- Connections
  (1) Affine connections
  (2) Levi-Civita connection
  (3) Parallel transport
  (4) Hessian, Laplacian
- Geodesics
  (1) Existence and uniqueness
  (2) First variation formula
  (3) Exponential map and Gauss lemma
  (4) Completeness and Hopf-Rinow theorem
- Curvature
  (1) Riemannian curvature tensor
  (2) Sectional curvatures
  (3) Ricci and scalar curvatures
  (4) Tensors
- Jacobi fields
  (1) The Jacobi equation
  (2) Conjugate points
  (3) Second variation formula
- Comparison theorems
  (1) Riccati equation
  (2) Gromov lemma
  (3) Rauch comparison theorem
  (4) Gromov-Bishop comparison theorem
(5) Meyer theorem
(6) Cheng theorem
(7) Calabi-Yau volume estimate
(8) Cartan-Hadamard theorem

• Injectivity radius
  (1) The cut locus
  (2) Injectivity radius
  (3) Cheeger estimate

• Submanifolds
  (1) Induced metric
  (2) Second fundamental form
  (3) The normal bundle connection
  (4) Gauss-Codazzi equations
  (5) Mean curvature
  (6) Variation formulas
  (7) Minimal submanifolds