

DEPARTMENT OF MATHEMATICS

ORAL EXAMINATION

**Minor area: TOPICS FOR DIFFERENTIAL GEOMETRY**

**Reading material:**

Do Carmo: Differential Geometry of Curves and Surfaces  
Do Carmo: Riemannian Geometry

**Topics:**

Riemannian Metrics  
Levi Civita connections  
Curvatures (Sectional, Ricci, Scalar)  
Gauss Equations for Submanifolds (second fundamental form)  
Geodesics  
Gauss Lemma  
Hopf Rinow Theorem  
Jacobi Fields  
First and second variation of arc length & energy  
Spaces of constant curvature  
Bonnet-Meyers Theorem  
Hadamard's Theorem  
Surfaces in  $\mathbf{R}^3$   
Surfaces of revolution  
Geodesics on surfaces of revolution (Clairaut's relation)  
Gauss-Bonnet Theorem  
Cut Points & Conjugate Points: cut locus; conjugate locus  
Synge Lemma