

Math 3355 Course Outline

Instructor: A. Dean , RB 2009, ext 8689. email: andrew.j.dean@lakeheadu.ca

Office Hours: By appointment or happenstance.

Text: *Differential Geometry of Curves and Surfaces, 2nd ed.*, by Banchoff and Lovett, CRC Press.

Tentative Schedule

Week 1. (Jan 4) Parametrisations; position, velocity, and acceleration; curvature; evolutes and involutes; and natural equations.

Week 2. (Jan 11) Basic properties of plane curves; rotation index; isoperimetric inequality; curvature, convexity, and the four-vertex theorem.

Week 3. (Jan 18) Definitions, examples, and differentiation of curves in space; curvature, torsion, and the Frenet frame; osculating plane and osculating sphere; natural equations.

Week 4. (Jan 25) Basic properties of curves in space, indicatrices and total curvature, knots and links.

Week 5. (Feb 1) Parametrised surfaces, tangent planes and regular surfaces, change of coordinates.

Week 6. (Feb 8) The tangent space and the normal vector, orientable surfaces.

Study Week

Week 7. (Feb 22) The first fundamental form, the Gauss map, the second fundamental form.

Week 8. (Feb 29) Normal and principal curvatures, gaussian and mean curvatures, ruled surfaces and minimal surfaces.

Week 9. (March 7) Tensor notation, Gauss' equations, and the Christoffel symbols.

Week 10. (March 14) Codazzi equations and the Theorema Egregium, the fundamental theorem of surface theory.

Week 11. (March 21) Curvatures and torsions on surfaces, geodesics, geodesic coordinates.

Week 12. (March 28) The Gauss-Bonnet theorem and applications, intrinsic geometry.

Grading Scheme: There will be eleven homework assignments. These will count for 10% each, with the lowest mark being dropped.

Drop Date: The final date to withdraw from this course without academic penalty is Friday March 4.

Academic Dishonesty: All cases of academic dishonesty will be dealt with according to the university's Code of Student Behaviour and Disciplinary Procedures.