Spring 2015  
Math 5378: Differential Geometry of Curves and Surfaces  
Syllabus and Homework List

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Homework: (due each Monday, 30% of course grade)  
Unless otherwise indicated, problems are from the text:  
Manfredo P. DoCarmo, Differential Geometry of Curves and Surfaces.  

Monday, February 2:  
- Sect. 1-5: Local theory of curves parameterized by arc length. pp. 22ff: # 2, 4, 9, 13, 17a.  
- Sect. 1-6: Local canonical form. pp. 29ff: # 2, 3.  

Monday, February 9:  
- Sect. 1-5, pp. 22ff: # 5, 8, 11, 14.  
- Sect. 1-7, pp. 47ff: # 8a, 13.

Monday, February 16:  
- Sect. 2-2: Regular surfaces. pp. 65ff: # 3, 4, 7, 8, 11, 13, 16.

Monday, February 23:  
- Sect. 2-3: Change of parameters. pp. 80ff: # 4, 5, 10, 12.  
- Sect. 2-4: Tangent plane, differential of a map. pp. 88ff: # 1, 2, 4.

Monday, March 2:  
- Sect. 2-4, pp. 88ff: # 9, 10, 15, 19.  
- Sect. 2-5: First Fundamental Form; Area. pp. 99ff: # 1c, 3, 4, 11.

Monday, March 9:  
- Sect. 2-5, pp. 99ff: # 5, 7, 8, 10, 12, 14.  

Monday, March 16:  
Spring Break

Monday, March 23:  
- Sect. 3-2: Gauss map. pp. 151ff: # 2, 3, 5, 8, 9, 10.
Monday, March 30:
- Sect. 3-2, pp. 151ff: # 15, 18.
- Sect. 3-3: Second Fundamental Form. pp. 168ff: # 2, 5, 6.

Monday, April 6:
- Sect. 3-3, pp. 168ff: # 13, 20.
- Sect. 3-4: Vector fields. pp. 185ff: # 5, 9b.

Monday, April 13:
- Sect. 4-2: Intrinsic Geometry. pp. 227ff: # 6 (see #5), 15, 19.
- Gauss Theorem; Bonnets Theorem. pp. 237ff: # 1, 3.

Monday, April 20:
- Sect, 4-3, pp. 237ff: #5, 6 (use Theorema Egregium), 8b.
- Sect. 4-4: Parallel Transport and Geodesics. pp. 260ff: # 1, 5, 7b.

Monday, April 27:
- Sect. 4-4, pp. 260ff: # 15, 21.
- The Gauss-Bonnet Theorem; Poincaré Theorem about Singularities of Vector Fields. pp.282ff: # 1, 2, 3, 5, 6ce, 9.

Monday, May 4:
- Sect. 4-6: Geodesic polar coordinates. pp. 294ff: # 1, 2, 3, 5 (correction: p ∈ C, \(\lim_{\varphi \to 0}\)), 7, 11.

Suggestions for homework: Homework may be done in consultation with other class members if desired, but the majority of the work should be your own, and must be written up independently.

Exams:

Midterm: Wednesday, March 11. Covers Do Carmo Chapters 1 and 2, except pp. 41–46 of Sect. 1-7, Sects. 2-7 and 2-8. 25% of course grade

Final: Friday, May 15: 8:00 am–10:00 pm. Covers Do Carmo, Chapters 1, 2, 3, 4 and 5 except pp. 41–46 of Sect. 1-7, Sects. 2-7 and 2-8; pp. 226–227 of Sect. 4-2; Sect. 4-7; Sects. 5-3, Sects. 5-6 through 5-11. 45% of course grade