

Syllabus for Math 20900: Elements of Calculus and Statistics

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Text: *Mathematical Methods for the Life Sciences*, by E. Grossman, available from the Mathematics Department.

Mathematical content:

Aspects of ordinary differential equations, with particular reference to biological applications. Introduction to probability and statistics.

Computer content:

MS Excel spreadsheets are used to illustrate some of the mathematical topics. Some of the computer work requires using customized Excel files or particular data sets. These can be downloaded as a self-extracting zip file from the Department website for math 209.

Section	Topic	Time (in hrs)
1.1- 1.2	Differentiation & Integration (mostly review)	2
Appendix A	Introduction to Excel	.5
2.1 – 2.2	Intro. to ordinary differential equations, separation of variables	2.5
2.3	Exponential growth	.5
3.1-3.2	Euler's Method	2
3.3	Modified Euler	<.5
4.4 – 4.2	Steady state solutions of autonomous ODEs	1
4.3	Geometric analysis	2
4.4	Stability	1
5.1 – 5.2	Malthus model, harvesting	1.5
5.3	Logistic model	1.5
6.1- 6.2	Intro to systems of ODEs; competition models	3.5
6.3	Steady States & Phase Plots	1
6.4 – 6.5	Stability, null-clines; applications to epidemics	Omit
7.1 – 7.2	Histograms	1
7.3 – 7.4	Measures of centrality and spread	1
7.5 – 7.6	Box plots & estimation	1
8.1 – 8.3	Scatter plots, correlation coefficient	2
9.1 – 9.2	Method of least squares	1.5
9.3	Prediction	1
9.4 – 9.5	More on regression	Omit

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10.1 – 10.2	Intro. to Probability	1
10.3 – 10.4	Classical probability, counting	2
10.5	Probability rules	2
11.1	$P(A \text{ or } B)$	1
11.2	Independence	1.5
11.3	Conditional probability & Bayes' Theorem	optional
12.1 – 12.4	Genetics	omit
13.1 – 13.2	Discrete Random variables	2
13.3	Binomial distribution	1.5
13.4	Poisson distribution	1
14.1 – 14.2	Continuous random variables; uniform distribution	1.5
14.3	Standard normal distribution	1.5
14.4	Normal distributions	1.5
14.5	Normal approximation to the binomial distribution	1.5
15.1 – 15.3	Statistical Inference – confidence intervals	4
15.4	Small samples (t distribution)	1
	Total Hours (excluding testing, review & optional topics) (semester = 56 hours)	49.5