

## Lecture and Laboratory Calendar

This calendar will be updated throughout the semester. Students should consult this calendar weekly to obtain the required reading assignments for the laboratory.

### Week of 3—7 September

Lectures		
	Topics	Reading
<b>M</b> 09/03	Labor Day, No Lectures	
<b>W</b> 09/05 Lect. 1	Course organization and introduction to Mathematica, Common Errors for Beginners	Course Notes and Mathematica Notebook <i>I</i>
<b>F</b> 09/07 Lect. 2	Introduction to Mathematica, assignment and evaluation, rules and replacement, basic calculus and plotting, lists and matrices, getting help	Course Notes and Mathematica Notebook <i>II</i>

Laboratory		
Date	Topics	Reading
<b>Th</b> 09/06 Lab 0	Discussion of Laboratory and Expectations	<i>Start Reading, finding tutorials for Laboratory 0 as Soon as Possible.</i>

Homework		
Homework Set	Out	Due
1	<b>5 Sept.</b>	12 Sept. (10AM)

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## Week of 10—14 September

Lectures		
	Topics	Reading
<b>M</b> 09/10 Lect. 3	Mathematica programming: functions and patterns, localized variables, logical switches, recursion; Graphics: plotting lists of data, examples	Course Notes and Mathematica Notebook <i>III</i>
<b>W</b> 09/12 Lect. 4	Mathematica: symbolic and numerical operations, operations on expressions, solving equations, numerical solutions, file input and output, using packages	Course Notes and Mathematica Notebook <i>IV</i>
<b>F</b> 09/14 Lect. 5	Mathematica: overview of graphics, animation, interaction, graphics primitives, complete worked examples	Course Notes and Mathematica Notebook <i>V</i>

Laboratory		
Date	Topics	Reading
<b>Th</b> 09/13 Lab 1	Symbolic calculations, calculus and plotting	<p><i>Mathematica Help Browser</i> “<b>First Five Minutes with Mathematica,</b>”</p> <p>“<b>tutorial/YourFirstMathematicaCalculations,</b>”</p> <p>“<b>tutorial/AlgebraicCalculationsOverview.</b>”</p> <p>“<b>tutorial/BasicEditingTechniquesOverview,</b>”</p> <p>“<b>tutorial/ListsOverview,</b>”</p> <p>“<b>tutorial/DefiningFunctions,</b>”</p> <p>“<b>tutorial/BasicPlotting,</b>”</p> <p>“<b>tutorial/Options</b>”</p> <p><a href="http://www.wolfram.com/broadcast/#Tutorials-GS">http://www.wolfram.com/broadcast/#Tutorials-GS</a>  <b>(“Hands-On Tutorials”)</b></p> <p><b>Functions: Integrate, Table, Simplify, NIntegrate, Plot, Plot3D, ContourPlot</b></p>

Homework		
Homework Set	Out	Due
1	5 Sept.	<b>12 Sept. (10AM)</b>
2	5 Sept.	19 Sept. (10AM)

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## Week of 17—21 Sept.

Lectures		
	Topics	Reading
M 09/17 Lect. 6	Linear algebra: matrix operations, interpretations of matrix operations, multiplication, transposes, index notation	<i>Kreyszig</i> 4.0, 7.1, 7.2, 7.3, 7.4, 7.5
F 09/19 Lect. 7	Linear algebra: solutions to linear systems of equations, determinants, matrix inverses, linear transformations and vector spaces	<i>Kreyszig</i> 7.7, 7.8, 7.9
F 09/21	Student Holiday, No Lectures	

Laboratory		
Date	Topics	Reading
Th 09/20 Lab 2	Solving linear systems of equations	<i>Mathematica Help Browser</i> “tuto- <b>rial/ConstructingMatrices,”</b> <b>“tutorial/GettingAndSettingPiecesOfMatrices,”</b> <b>“tutorial/OperationsOnScalarsVectorsAndMatrices,”</b> <b>“tutorial/MultiplyingVectorsAndMatrices,”</b> <b>“tutorial/VectorOperations,”</b> <b>“tutorial/MatrixInversion,”</b> <b>“tutorial/BasicMatrixOperations,”</b> <b>“tutorial/SolvingLinearSystems,”</b> <b>“tutorial/EigenvaluesAndEigenvectors”;</b>  <b>Functions: Solve, Inverse, Transpose, Eigensystem</b>

Homework		
Homework Set	Out	Due
2	5 Sept.	<b>19 Sept. (10AM)</b>
3	5 Sept.	26 Sept. (10AM)

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## Week of 24—28 September

Lectures		
	Topics	Reading
<b>M</b> 09/24 Lect. 8	Complex numbers: complex plane, addition and multiplication, complex conjugates, polar form of complex numbers, powers and roots, exponentiation, hyperbolic and trigonometric forms	<i>Kreyszig</i> <b>13.1, 13.2, 13.3, 13.4,13.6</b>
<b>W</b> 09/26 Lect. 9	Matrix eigenvalues: eigenvalue/eigenvector definitions, invariants, principal directions and values, symmetric, skew-symmetric, and orthogonal systems, orthogonal transformations	<i>Kreyszig</i> <b>8.1, 8.2, 8.3, 8.4</b>
<b>F</b> 09/28 Lect. 10	Hermitian forms, similar matrices, eigenvalue basis, diagonal forms	<i>Kreyszig</i> <b>8.4, 8.5</b>

Laboratory		
Date	Topics	Reading
<b>Th</b> 09/27 Lab 3	File input/output, plotting data	<i>Mathematica Help Browser</i> “ <b>tutorial/ImportingAndExportingFiles,</b> ” “ <b>tutorial/ImportingAndExportingData,</b> ” “ <b>tutorial/lottingListsOfData,</b> ” “ <b>tutorial/ManipulatingNumericalData,</b> ” “ <b>tutorial/CurveFitting,</b> ” “ <b>guide/Statistics</b> ”;  <b>Functions: Dimensions, Append, AppendTo, Mean, StandardDeviation, ListPlot, Table, MultipleListPlot, Fit, FindFit</b>

Homework		
Homework Set	Out	Due
3	5 Sept.	<b>26 Sept. (10AM)</b>
4 (hard!)	17 Sept.	<b>17 Oct. (10AM)</b>

## Week of 1—5 October

3.014 Laboratory Week: 3.016 does not meet (*However*, homework 4—which is hard—is due 17 Oct.)

## Week of 08—12 October

Lectures		
	Topics	Reading
<b>M</b> 10/08	Columbus Day, No Lectures	
<b>W</b> 10/10 Lect. 11	Vector calculus: vector algebra, inner products, cross products, determinants as triple products, derivatives of vectors	<i>Kreyszig</i> <b>9.1, 9.2, 9.3, 9.4</b>
<b>F</b> 10/12 Lect. 12	Multi-variable calculus: curves and arc length, differentials of scalar functions of vector arguments, chain rules for several variables, change of variable and thermodynamic notation, gradients and directional derivatives	<i>Kreyszig</i> <b>9.5, 9.6, 9.7</b>

Laboratory		
Date	Topics	Reading
<b>Th</b> 10/11 Lab 4	Graphical representations in three and higher dimensions	<i>Mathematica Help Browser</i> “ <b>tutorial/BasicPlotting,</b> ” “ <b>tutorial/RedrawingAndCombiningPlots,</b> ” “ <b>tutorial/ThreeDimensionalSurfacePlots,</b> ” “ <b>tutorial/ParametricPlots,</b> ” “ <b>tutorial/SomeSpecialPlots,</b> ”

Homework		
Homework Set	Out	Due
4	17 Sep.	17 Oct.
5	1 Oct.	24 Oct.

**Week of 15—19 October**

Lectures		
	Topics	Reading
<b>M</b> 10/15 Lect. 13	Vector differential operations: divergence and its interpretation, curl and its interpretation	<i>Kreyszig</i> <b>9.8, 9.9</b>
<b>W</b> 10/17 Lect. 14	Path integration: integral over a curve, change of variables, multidimensional integrals	<i>Kreyszig</i> <b>10.1, 10.2, 10.3</b>
<b>F</b> 10/19 Lect. 15	Multidimensional forms of the Fundamental theorem of calculus: Green's theorem in the plane, surface representations and integrals	<i>Kreyszig</i> <b>10.4, 10.5, 10.6, 10.7, 10.8, 10.9</b>

Laboratory		
Date	Topics	Reading
<b>Th</b> 10/18 Lab 5	Multivariable Calculus	<i>Mathematica Help Browser</i> “ <b>tutorial/Differentiation,</b> ” “ <b>VectorAnalysis/tutorial/VectorAnalysis,</b> ” “ <b>VectorAnalysis/guide/VectorAnalysisPackage,</b> ”

Homework		
Homework Set	Out	Due
4	17 Sept.	<b>17 Oct (10AM)</b>
5	1 Oct.	24 Oct.

**Week of 22—26 October**

3.014 Laboratory Week: 3.016 does not meet (*However*, homework 5 is due on Wednesday by 10AM).

Homework		
Homework Set	Out	Due
5	1 Oct.	<b>24 Oct. (10AM)</b>
6	1 Oct.	6 Nov.

## Week of 29 October—2 November

Lectures		
	Topics	Reading
<b>M</b> 10/29 Lect 16	Multi-variable calculus: triple integrals and divergence theorem, applications and interpretation of the divergence theorem, Stokes' theorem.	<i>Kreyszig</i> <b>10.7, 10.8, 10.9</b>
<b>W</b> 10/31 Lect. 17	Periodic functions: Fourier series, Interpretation of Fourier coefficients, convergence, odd and even expansions	<i>Kreyszig</i> <b>11.1, 11.2, 11.3</b>
<b>F</b> 11/02 Lect. 18	Fourier theory: complex form of Fourier series, Fourier integrals, Fourier cosine and sine transforms, the Fourier transforms	<i>Kreyszig</i> <b>11.4, 11.6, 11.7, 11.8</b>

Laboratory		
Date	Topics	Reading
<b>Th</b> 11/01 Lab 6	Optimization	<i>Mathematica Help Browser</i> “ <b>tutorial/NumericalOptimization</b> ”;  <b>Functions: Minimize, Maximize, FindMinimum</b>

Homework		
Homework Set	Out	Due
6	15 Oct.	07 Nov.
7 (hard!)	15 Oct.	07 Dec.

## Week of 5—9 November

Lectures		
	Topics	Reading
<b>M</b> 11/05 Lect 19	Ordinary differential equations: physical interpretations, geometrical interpretations, separable equations	<i>Kreyszig</i> <b>1.1, 1.2, 1.3</b>
<b>W</b> 11/07 Lect. 20	ODEs: derivations for simple models, exact equations and integrating factors, the Bernoulli equation	<i>Kreyszig</i> <b>1.4, 1.5</b>
<b>F</b> 11/09 Lect. 21	Higher order differential equations: homogeneous second order, initial value problems, second order with constant coefficients, solution behavior	<i>Kreyszig</i> <b>2.1, 2.2</b>

Laboratory		
Date	Topics	Reading
<b>Th</b> 11/08 Lab 7	Solving Differential Equations	<i>Mathematica Help Browser</i> “ <b>tutorial/DifferentialEquations,</b> ” “ <b>tutorial/IntroductionToNumericalDifferentialEquations,</b> ” “ <b>tutorial/NumericalSolutionOfDifferentialEquations</b> ”

Homework		
Homework Set	Out	Due
6	15 Oct.	<b>7 Nov. (10AM)</b>
7 (hard!)	1 Nov.	5 Dec. (10AM)

## Week of 12—16 November

3.014 Laboratory Week: 3.016 does not meet (*However*, homework 7 is difficult and due 5 Dec.).



## Week of 19—23 Novemeber

Lectures		
	Topics	Reading
M 11/19	3.014 lab continues, no lecture	
W 11/21 Lect. 22	Differential operators, damped and forced harmonic oscillators, non-homogeneous equations	<i>Kreyszig</i> 2.3,2.4, 2.7, 2.8, 2.9
F 11/25	Holiday, No Lectures	

## Holiday, No Laboratory

Date	Topics	Reading
Th 11/24	Holiday, no laboratory	

## Homework

Homework Set	Out	Due
7 (Hard!)	1 Nov.	5 Dec

## Week of 26–30 Novmeber

Lectures		
	Topics	Reading
M 11/26 Lect. 23	Resonance phenomena, higher order equations, beam theory	<i>Kreyszig</i> 2.8, 2.9, 3.1, 3.2, 3.3
W 11/28 Lect. 24	Systems of differential equations, linearization, stable points, classification of stable points	<i>Kreyszig</i> 4.1, 4.2
F 11/30 Lect. 25	Linear differential equations: phase plane analysis and visualization	<i>Kreyszig</i> 4.3, 4.4

## Laboratory

Date	Topics	Reading
Th 11/29 Lab 8	Solving Differential Equations	<i>Mathematica Help Browser</i> “tutorial/DifferentialEquations,” “tutorial/IntroductionToNumericalDifferentialEquations,” “tutorial/NumericalSolutionOfDifferentialEquations”

## Homework

Homework Set	Out	Due
7 (Hard!)	01 Nov.	5 Dec

**Week of 3—7 December**

Lectures		
	Topics	Reading
<b>M</b> 12/5 Lect. 26	PDEs, separation of variables.	<i>Kreyszig</i> <b>12.1—12.6</b>
<b>W</b> 12/7 Lect. 27	TBA	
<b>F</b> 12/09	3.014 Laboratory, No Lecture	

**No Laboratory**

Homework		
Homework Set	Out	Due
7	15 Oct.	<b>5 Dec (10AM)</b>

**Week of 10—14 December**

3.014 Laboratory Week: 3.016 does not meet