

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
M 09/03	Labor Day, No Lectures	
W 09/05 Lect. 1	Course organization and introduction to Mathematica, Common Errors for Beginners	Course Notes and Mathematica Notebook <i>I</i>
F 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
Th 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	5 Sept.	12 Sept. (10AM)

Week of 10—14 September

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

Homework		
Homework Set	Out	Due
1	5 Sept.	12 Sept. (10AM)
2	5 Sept.	19 Sept. (10AM)

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- rial/ConstructingMatrices,” “tutorial/GettingAndSettingPiecesOfMatrices,” “tutorial/OperationsOnScalarsVectorsAndMatrices,” “tutorial/MultiplyingVectorsAndMatrices,” “tutorial/VectorOperations,” “tutorial/MatrixInversion,” “tutorial/BasicMatrixOperations,” “tutorial/SolvingLinearSystems,” “tutorial/EigenvaluesAndEigenvectors”; Functions: Solve, Inverse, Transpose, Eigensystem

Homework		
Homework Set	Out	Due
2	5 Sept.	19 Sept. (10AM)
3	5 Sept.	26 Sept. (10AM)

Week of 24—28 September

Lectures		
	Topics	Reading
M 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> 13.1, 13.2, 13.3, 13.4,13.6
W 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> 8.1, 8.2, 8.3, 8.4
F 09/28 Lect. 10	Hermitian forms, similar matrices, eigenvalue basis, diagonal forms	<i>Kreyszig</i> 8.4, 8.5

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

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

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
M 10/08	Columbus Day, No Lectures	
W 10/10 Lect. 11	Vector calculus: vector algebra, inner products, cross products, determinants as triple products, derivatives of vectors	<i>Kreyszig</i> 9.1, 9.2, 9.3, 9.4
F 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> 9.5, 9.6, 9.7

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

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

Week of 15—19 October

Lectures		
	Topics	Reading
M 10/15 Lect. 13	Vector differential operations: divergence and its interpretation, curl and its interpretation	<i>Kreyszig</i> 9.8, 9.9
W 10/17 Lect. 14	Path integration: integral over a curve, change of variables, multidimensional integrals	<i>Kreyszig</i> 10.1, 10.2, 10.3
F 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> 10.4, 10.5, 10.6, 10.7, 10.8, 10.9

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

Homework		
Homework Set	Out	Due
4	17 Sept.	17 Oct (10AM)
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.	24 Oct. (10AM)
6	1 Oct.	6 Nov.

Week of 29 October—2 November

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

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

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

Week of 5—9 November

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

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

Homework		
Homework Set	Out	Due
6	15 Oct.	7 Nov. (10AM)
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
M 12/5 Lect. 26	PDEs, separation of variables.	<i>Kreyszig</i> 12.1—12.6
W 12/7 Lect. 27	TBA	
F 12/09	3.014 Laboratory, No Lecture	

No Laboratory

Homework		
Homework Set	Out	Due
7	15 Oct.	5 Dec (10AM)

Week of 10—14 December

3.014 Laboratory Week: 3.016 does not meet