

3.016 Course Calendar 2011

Week of 5—9 September

Lectures		
	Topics	Reading
M 09/05	Labor Day, No Lectures	
W 09/07 Lect. 1	Course organization and introduction to Mathematica, Common Errors for Beginners	Course Notes and Mathematica Notebook <i>I</i>
F 09/09 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 09/08 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	7 Sept.	16 Sept. (6PM)

Week of 12—16 September

Lectures		
	Topics	Reading
M 09/12 Lect. 3	Mathematica programming: functions and patterns, localized variables, logical switches, recursion; Graphics: plotting lists of data, examples	Course Notes and Mathematica Notebook III
W 09/14 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 IV
F 09/16 Lect. 5	Mathematica: overview of graphics, animation, interaction, graphics primitives, complete worked examples	Course Notes and Mathematica Notebook V

Laboratory		
Date	Topics	Reading
Th 09/15 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	7 Sept.	16 Sept. (6PM)
2	14 Sept.	23 Sept. (6PM)

Week of 19—23 Sept.

Lectures		
	Topics	Reading
M 09/19 Lect. 6	Linear algebra: matrix operations, interpretations of matrix operations, multiplication, transposes, index notation	<i>Kreyszig</i> 7.1, 7.2, 7.3, 7.4 (pages: 272–276, 278–286, 287–294, 296–301)
W 09/21	Student Holiday, No Lectures	
F 09/23 Lect. 7	Linear algebra: solutions to linear systems of equations, determinants, matrix inverses, linear transformations and vector spaces	<i>Kreyszig</i> 7.5, 7.6, 7.7, 7.8, 7.9 (pages: 302–305, 306–307, 308–314, 315–323, 323–329)

Laboratory		
Date	Topics	Reading
Th 09/22 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
3	21 Sept.	30 Sept. (6PM)
4 (counts double)	5 Oct.	21 Oct. (6PM)

Week of 26—30 September

3.014 Laboratory Week: 3.016 does not meet (Homework is due on Friday).

Week of 03—07 October

Lectures		
	Topics	Reading
M 10/03 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, 13.5, 13.6 (pages: 602–606, 607–611, 623–626, 626–629)
W 10/05 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 (pages: 334–338, 340–343, 345–348)
F 10/07 Lect. 10	Hermitian forms, similar matrices, eigenvalue basis, diagonal forms	<i>Kreyszig</i> 8.4, 8.5 (pages: 349–354, 356–361)

Laboratory		
Date	Topics	Reading
Th 10/6 Lab 3	File input/output, plotting data	<p><i>Mathematica Help Browser</i> “tutorial/ImportingAndExportingFiles,” “tutorial/ImportingAndExportingData,” “tutorial/lottingListsOfData,” “tutorial/ManipulatingNumericalData,” “tutorial/CurveFitting,” “guide/Statistics”;</p> <p>Functions: Dimensions, Append, AppendTo, Mean, StandardDeviation, ListPlot, Table, MultipleListPlot, Fit, FindFit</p>

Homework		
Homework Set	Out	Due
4 (counts double)	5 Oct.	21 Oct. (6PM)
5	2 Nov.	11 Nov. (6PM)

Week of 10—14 October

Lectures		
	Topics	Reading
M 10/10	Columbus Day, No Lectures	
W 10/12 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 (pages: 364–369, 371–374, 377–383, 384–388)
F 10/14 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 (pages: 389–398, 400–403, 403–409)

Laboratory		
Date	Topics	Reading
Th 10/13 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
5	2 Nov.	11 Nov.
6	9 Nov.	(18 Nov.)

Week of 17—21 October

3.014 Laboratory Week: 3.016 does not meet (Homework is due on Friday).

 Week of 24—28 October

Lectures		
	Topics	Reading
M 10/24 Lect. 13	Vector differential operations: divergence and its interpretation, curl and its interpretation	<i>Kreyszig</i> 9.8, 9.9 (pages: 410–413, 414–416)
W 10/26 Lect. 14	Path integration: integral over a curve, change of variables, multidimensional integrals	<i>Kreyszig</i> 10.1, 10.2, 10.3 (pages: 420–425, 426–432, 433–439)
F 10/28 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 (pages: 439–444, 445–448, 449–458, 459–462)

Laboratory		
Date	Topics	Reading
Th 10/27 Lab 5	Multivariable Calculus	<i>Mathematica Help Browser</i> “ tutorial/Differentiation, ” “ VectorAnalysis/tutorial/VectorAnalysis, ” “ VectorAnalysis/guide/VectorAnalysisPackage, ”

Homework		
Homework Set	Out	Due
6	9 Nov.	18 Nov.
7	29 Nov.	9 Dec. (6PM)

 Week of 31 October—4 November

Lectures		
	Topics	Reading
M 10/31 Lect 16	Multi-variable calculus: triple integrals and divergence theorem, applications and interpretation of the divergence theorem, Stokes' theorem.	<i>Kreyszig</i> 10.8, 10.9 (pages: 463–467, 468–473)
W 11/02 Lect. 17	Periodic functions: Fourier series, Interpretation of Fourier coefficients, convergence, odd and even expansions	<i>Kreyszig</i> 11.1, 11.2, 11.3 (pages: 478–485, 487–489, 490–495)
F 11/04 Lect. 18	Fourier theory: complex form of Fourier series, Fourier integrals, Fourier cosine and sine transforms, the Fourier transforms	<i>Kreyszig</i> 11.4, 11.7, 11.8, 11.9 (pages: 496–498, 506–512, 513–517, 518–523)

Laboratory		
Date	Topics	Reading
Th 11/03 Lab 6	Optimization	<i>Mathematica Help Browser</i> “ tutorial/NumericalOptimization ”; Functions: Minimize, Maximize, FindMinimum

No homework handed out or due.

Week of 7—11 November

Lectures		
	Topics	Reading
M 11/07 Lect 19	Ordinary differential equations: physical interpretations, geometrical interpretations, separable equations	<i>Kreyszig</i> 1.1, 1.2, 1.3 (pages: 2–8, 9–11, 12–17)
W 11/09 Lect. 20	ODEs: derivations for simple models, exact equations and integrating factors, the Bernoulli equation	<i>Kreyszig</i> 1.4, 1.5 (pages: 19–25, 26–32)
F 11/11	Holiday, No Lectures	

Laboratory		
Date	Topics	Reading
Th 11/10 Lab 7	Solving Differential Equations	<i>Mathematica Help Browser</i> “tutorial/DifferentialEquations,” “tutorial/IntroductionToNumericalDifferentialEquations,” “tutorial/NumericalSolutionOfDifferentialEquations”

Homework		
Homework Set	Out	Due
7	23 Nov.	9 Dec

Week of 14—18 November

3.014 Laboratory Week: 3.016 does not meet (Homework is due on Friday).

Week of 21—25 November

Lectures		
	Topics	Reading
M 11/21 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 (pages: 45–52, 53–58)
W 11/23 Lect. 22	Differential operators, damped and forced harmonic oscillators, non-homogeneous equations	<i>Kreyszig</i> 2.3, 2.4, 2.7 (pages: 59–60, 61–69, 78–83)
F 11/25	Holiday, No Lectures	

Laboratory		
Date	Topics	Reading
Th 11/24 Lab 8	Solving Differential Equations	<i>Mathematica Help Browser</i> “ tutorial/DifferentialEquations, ” “ tutorial/IntroductionToNumericalDifferentialEquations, ” “ tutorial/NumericalSolutionOfDifferentialEquations ”

Week of 28 November—2 December

Lectures		
	Topics	Reading
M 11/28 Lect. 23	Resonance phenomena, higher order equations, beam theory	<i>Kreyszig</i> 2.8, 2.9, 3.1, 3.2, 3.3 (pages: 84–90, 91–96, 105–111, 111–115, 116–121)
W 11/30 Lect. 24	Systems of differential equations, linearization, stable points, classification of stable points	<i>Kreyszig</i> 4.1, 4.2 (pages: 131–135, 136–139)
F 12/02 Lect. 25	Linear differential equations: phase plane analysis and visualization	<i>Kreyszig</i> 4.3, 4.4 (pages: 139–146, 147–150)

Laboratory		
Date	Topics	Reading
Th 12/1 Lab 9	Solving Differential Equations	<i>Mathematica Help Browser</i> “ tutorial/DifferentialEquations, ” “ tutorial/IntroductionToNumericalDifferentialEquations, ” “ tutorial/NumericalSolutionOfDifferentialEquations ”

Week of 5—9 December

Lectures		
	Topics	Reading
M 12/5 Lect. 26	PDEs, separation of variables.	<i>Kreyszig</i> 11.1—11.10 (pages: 583—629)
W 12/7 Lect. 27	TBA	
F 12/09	3.014 Meets, No Lecture	