

MA103 AY26-1 Course Syllabus				
Textbook: Introduction to Management Scienc and Business Analytics by Hillier & Hillier (page numers given are the green numbers); Supplemental Readings on Canvas				
BLOCK 1: Modeling with Descriptive Statistics				
Lesson	Date	Topic Reading	Assessments	Lesson Objectives
Lesson 1	8/18/2025	Intro to Modeling I pg 15-27, Reading 1.1		1. Learn how to contribute positively to our classroom culture. 2. Be familiar with course documents and know the course expectations, including how the Honor Code applies to this course. 3. Describe the Modeling Triangle.
Lesson 2	8/19/2025	Intro to Modeling II pg 15-27, Reading 1.1		4. Describe the modeling process. 5. Be able to identify and explain what modeling decisions and assumptions are. 6. Be able to justify a modeling assumption as reasonable and necessary. 7. Use the MA103 Ethics Checklist.
Lesson 3	8/20/2025	Descriptive Statistics I pg 42-49 (Sec. 2.3), Reading 1.2		1. Understand the types of questions that can be modeled with descriptive statistics. 2. Understand how to apply the modeling triangle using descriptive statistics.
Lesson 4	8/21/2025	Descriptive Statistics II pg 42-49 (Sec. 2.3), Reading 1.2		3. Identify and justify assumptions. 4. Identify modeling decisions. 5. Apply the MA103 Ethical Framework to assess modeling decisions.
Lesson 5	8/22/2025	Data Story - Data Set I pg. 50-56, Reading 1.3		1. Calculate and describe the center of a dataset using mean and median, by hand and with Excel.
Lesson 6	8/26/2025	Data Story - Data Set II pg. 50-56, Reading 1.3		2. Calculate and describe the spread of a dataset using sample standard deviation, by hand and with Excel.
Lesson 7	8/27/2025	Data Story - Data Set III pg. 50-56, Reading 1.3		3. Visualize a dataset using a histogram in Excel and describe the shape of the dataset.
Lesson 8	8/28/2025	Technology Lab 1	Assign Project 1	1. How to filter and sort data 2. How to construct a histogram, to include labeling, adjusting bin size, etc. 3. Calculate mean, median, and standard deviation of a sample 4. How to use these tools to help with data cleaning
Lesson 9	8/29/2025	Problem Solving Lab 1		
Lesson 10	9/2/2025	Data Story - Data Point I Reading 1.4		1. Calculate z-scores and interpret them as measures of relative standing.
Lesson 11	9/3/2025	Data Story - Data Point I Reading 1.4		2. Standardize datasets and identify usual and unusual data.
Lesson 12	9/4/2025	Technology Lab 2	Quiz 1	1. How to construct a scatter plot, to include labeling, adjusting markers, adding secondary data sets, changing marker color, adding legends, etc. 2. Using equations and cell references to propagate an equation down a column (calculating z-scores). 3. Using filter and sort functionality to identify potential outliers. 4. Comparing across variables using z-scores
Lesson 13	9/5/2025	Problem Solving Lab 2		
Lesson 14	9/8/2025	KNN I pg. 96-103 (Stop at Analytic Solver), pg 107-108 (Stop at Sec. 3.3), Reading 1.5		1. Create visualizations of standardized data, including color-coding data by category when appropriate.
Lesson 15	9/9/2025	KNN II pg. 96-103 (Stop at Analytic Solver), pg 107-108 (Stop at Sec. 3.3), Reading 1.5		2. Explain the concept of the KNN algorithm. 3. Use standardized distances to find nearest neighbors. 4. Use KNN to make a prediction.

Lesson	Date	Topic Reading	Assessments	Lesson Objectives
BLOCK 2: Modeling with Continuous Functions				
Lesson 16	9/10/2025	Intro to Predictive Modeling I Reading 2.1		1. Describe how to use the Modeling Triangle in this context. 2. Identify modeling questions that can appropriately be modeled using continuous functions. 3. Be familiar with families of functions.
Lesson 17	9/12/2025	WPR 1		1. Assess Block 1 Material; Lessons 1-15
Lesson 18	9/16/2025	Project Work Day	Transform and Solve Steps Due	
Lesson 19	9/17/2025	Intro to Predictive Modeling II Reading 2.1		4. Understand the difference between a first principles approach and an empirical approach to building a model. 5. Get introduced to the idea of R^2 . 6. Create a trendline in Excel and explore possible models with Excel.
Lesson 20	9/18/2025	Problem Solving Lab 3		
Lesson 21	9/19/2025	Linear Functions I pg. 172-176 (Sec. 4.5), Reading 2.2		1. Understand the parameters of a linear model, slope and y-intercept, and the roles of these parameters in changing the shape of the model 2. Be able to interpret the meaning of the parameters of a given linear model in the context of a real-world scenario
Lesson 22	9/22/2025	Linear Functions II pg. 172-176 (Sec. 4.5), Reading 2.2		3. Build a linear model using a first principles approach 4. Build a feasible linear model using an empirical approach 5. Define SSE and understand how minimizing it leads to an optimal solution for the parameters of a linear model
Lesson 23	9/25/2025	Linear Functions III pg. 172-176 (Sec. 4.5), Reading 2.2		6. Understand the connection between SSE and R^2 as measurements of the fit of a model 7. Build an optimal linear model using Excel trendline 8. Use a linear model to make a prediction and interpret the results in the context of a real-world scenario 9. Think through ethical considerations for using a linear model to make predictions
Lesson 24	9/26/2025	Project Work Day	Draft Technical Report Due	
Lesson 25	9/29/2025	Problem Solving Lab 4		
Lesson 26	9/30/2025	Exponential Functions I Reading 2.3		1. Understand the parameters of an exponential model, growth rate and y-intercept, and the roles of these parameters in changing the shape of the model 2. Be able to interpret the meaning of the parameters of a given exponential model in the context of a real-world scenario 3. Build an exponential model using a first principles approach 4. Define SSE and understand how minimizing it leads to an optimal solution for the parameters of an exponential model 5. Understand the connection between SSE and R^2 as measurements of the fit of a model
Lesson 27	10/1/2025	WRIT 0		1. Assess algebra, trigonometry, and other basic skills for placement into follow on Calculus Courses
Lesson 28	10/3/2025	Exponential Functions II Reading 2.3	Project 1 Due	6. Build a feasible exponential model using an empirical approach 7. Build an optimal exponential model using Excel 8. Use an exponential model to make a prediction and interpret the results in the context of a real-world scenario 9. Think through ethical considerations for using an exponential model to make predictions
Lesson 29	10/6/2025	Polynomial Functions I pg. 64-66, Reading 2.4		1. Understand some basic polynomial behaviors including: (a) long-term behavior of polynomials based on the sign of the leading coefficient and whether it is even or odd, and (b) how the number of possible local maxes and mins is determined by the degree of the polynomial. 2. Build polynomial models and other models using Excel trendline 3. Understand R^2 as measurements of the fit of a model
Lesson 30	10/7/2025	Polynomial Functions II pg. 64-66, Reading 2.4	Quiz 2	4. Understand and explain the risks of overfit and underfit, and use first principles to help avoid overfit 5. Use polynomial models to make predictions and interpret the results in the context of real-world scenarios 6. Think through ethical considerations for using polynomial models to make predictions
Lesson 31	10/8/2025	Select, Assess, Use I Reading 2.5		1. Use a first principles approach to select appropriate the appropriate model family 2. Use a first principles approach to select appropriate parameters for a model 3. Use an empirical approach to select appropriate the appropriate model family
Lesson 32	10/9/2025	Select, Assess, Use II Reading 2.5	Assign Project 2	4. Use an empirical approach to select appropriate parameters for a model 5. Use SSE and R^2 to assess and compare models 6. Articulate considerations that should be made in support of responsible and ethical uses of predictive models
Lesson 33	10/10/2025	Select, Assess, Use III Reading 2.5		7. Interpret and communicate results appropriately to an audience 8. Identify and justify modeling decisions and assumptions
Lesson 34	10/15/2025	WPR 2		1. Assess Block 2 Material; Lessons 16-33
Lesson 35	10/17/2025	Technology Lab 3		1. How to calculate SSE in Excel 2. Using Solver to find parameters that minimize SSE 3. Comparing trendline option to Solver solution to identify "best" parameters 4. Use Excel to highlight when a trendline may be misleading 5. Use Excel to conduct interpolation and extrapolation and assess model reliability

<i>Lesson</i>	<i>Date</i>	<i>Topic Reading</i>	<i>Assessments</i>	<i>Lesson Objectives</i>
Mini-Block: Modeling with Vectors and Matrices				
Lesson 36	10/20/2025	Vectors I Reading M.1		1. Understand how vectors can be used both to describe things in physical space and also to represent mathematical arrays that are not necessarily related to physical space
Lesson 37	10/21/2025	Vectors II Reading M.1		2. Be familiar with vector notations and terminology 3. Perform vector addition/subtraction and multiplication of a vector by a scalar 4. Compute and interpret dot products of vectors 5. Understand when vector operations are possible based on dimensions 6. Use vectors to solve modeling problems
Lesson 38	10/22/2025	Project Work Day	Transform and Solve Steps Due	
Lesson 39	10/23/2025	Problem Solving Lab 5		
Lesson 40	10/27/2025	Matrices I Reading M.2		1. Be familiar with matrix notation and terminology 2. Perform matrix addition/subtraction and multiplication of a matrix by a scalar
Lesson 41	10/28/2025	Project Work Day	Draft Technical Report Due	
Lesson 42	10/29/2025	Matrices II Reading M.2		3. Perform vector-matrix multiplication 4. Perform matrix multiplication 5. Find the determinant of a matrix 6. Find the inverse of a matrix
Lesson 43	10/30/2025	Matrices III Reading M.2		7. Understand when matrix operations are possible based on dimensions 8. Represent a 2-by-2 system of linear equations as a matrix
Lesson 44	11/3/2025	Matrices IV Reading M.2		9. Solve a system of linear equations using the inverse of a matrix 10. Explain the relationship between the number of solutions of a system of equations and the determinant of matrix
Lesson 45	11/4/2025	Technology Lab 4		1. Setting up matrices and vectors in Excel 2. Using SUMPRODUCT 3. Using MMULT 4. Using MINV 5. Using Excel to solve a system of equations larger than a 2x2

Lesson	Date	Topic Reading	Assessments	Lesson Objectives
BLOCK 3: Modeling with Linear Programming				
Lesson 46	11/5/2025	Intro to Prescriptive Modeling pg. 73-77 (Stop at Step 2.), Reading 3.1	Quiz 3	1. Describe how to use the Modeling Triangle in this context 2. Identify modeling questions that can appropriately be modeled using linear programming 3. Identify decision variables in the context of a linear programming problem
Lesson 47	11/6/2025	Constraints and Feasible Regions I pg. 206-109 (Stop at "Having identified..."), Reading 3.2		1. Understand what it means for a solution to be feasible in the context of a linear programming problem 2. Identify whether a potential solution is feasible or not 3. Represent constraints algebraically
Lesson 48	11/7/2025	Constraints and Feasible Regions II pg. 206-109 (Stop at "Having identified..."), Reading 3.2		4. Visualize constraints for a linear programming problem as a feasible region (by hand) 5. Explore feasible regions and compare solutions within the feasible region 6. Explain the four model-driven assumptions that are necessary to use a linear programming model, and justify each for a real-world modeling scenario
Lesson 49	11/12/2025	Objective Functions I pg. 209-210, Reading 3.3		1. Describe the difference between a feasible solution and an optimal solution 2. Identify the objective function for a linear program
Lesson 50	11/13/2025	Objective Functions II pg. 209-210, Reading 3.3		3. Represent the objective function algebraically 4. Use the graphical method to solve a modeling problem using linear programming
Lesson 51	11/14/2025	Objective Functions III pg. 209-210, Reading 3.3		5. Set up and solve a modeling problem with linear programming using Excel Solver 6. Interpret an optimal solution in the context of a modeling problem and articulate the optimal solution to a stakeholder 7. Understand how different objective functions can lead to different optimal solutions
Lesson 52	11/17/2025	Problem Solving Lab 6 (Optional) pg. 211-215 for Alternative Spreadsheet Setup		
Lesson 53	11/18/2025	What-if Analysis I pg. 324-325, Reading 3.4	Assign Project 3	1. Understand how changes to non-binding constraints impact the feasible region and the optimal solution
Lesson 54	11/19/2025	What-if Analysis II pg. 324-325, Reading 3.4		2. Understand how changes to binding constraints impact the feasible region and the optimal solution
Lesson 55	11/20/2025	What-if Analysis III pg. 324-325, Reading 3.4		3. Understand how changes in the objective function can change the optimal solution 4. Explore what-if analysis graphically
Lesson 56	11/24/2025	WPR 3		5. Interpret the results of a what-if analysis in the context of a modeling problem 1. Assess Mini-Block and Block 3 Material; Lessons 37-53
Lesson 57	11/25/2025	Robust Optimization I pg 351-353, Reading 3.5		1. Articulate the worst-case among multiple options in the context of a linear programming modeling problem
Lesson 58	12/2/2025	Robust Optimization II pg 351-353, Reading 3.5		2. Explore robust optimization graphically 3. Interpret the results of a robust optimization in the context of a modeling problem
Lesson 59	12/3/2025	Technology Lab 5		4. Analyze and articulate ethical considerations of performing prescriptive analytics using the ethics checklist 1. Other ways to set up a linear programming spreadsheet 2. Using Solver to conduct What-if Analysis 3. Using Solver to conduct Robust Optimization
Lesson 60	12/4/2025	Project Work Day	Quiz 4	
Lesson 61	12/5/2025	Problem Solving Lab 7		
Lesson 62	12/8/2025	Project Work Day		
Lesson 63	12/9/2025	Project Work Day	Project 3 Due	
Lesson 64	12/11/2025	Project Presentations		