

## ISYE 4031 REGRESSION AND FORECASTING

**Credit:** 3-0-3

**Prepared Profs,** Vengazhiyil, Goldsman, Sumer 2018

**Prerequisite(s):** ISYE 2028

### **Catalog Description:**

Regression analysis: multiple linear regression, diagnostics, and variable selection.  
Forecasting: exponential smoothing techniques and autoregressive moving average models.

### **Text:**

*Forecasting, Time Series, and Regression* by Bowerman, O'Connell, and Koehler, Duxbury Applied Series, 4<sup>th</sup> Edition, Duxbury Applied Series.

### **Objective**

The objective of this course is to learn about regression, time series, and other forecasting models and their applications in various fields of science and engineering.

### **Topical Outline**

Topics	Weeks
Introduction and review of statistics	1
Simple Linear Regression	2
Multiple linear regression	2
Model building and residual analysis	3
Advanced topics in regression	1
Forecasting: Time series regression	1
Exponential smoothing	1
ARIMA models	2
seasonal ARIMA modeling	1
Advanced topics in forecasting	1

### **Outcomes and their relationships to ISyE Program Outcomes**

At the end of this course, students will be able to:

1. Formulate real life problems using regression and forecasting models.
2. Collect appropriate data to estimate the models and understand which data are useful in solving the problem.
3. Use statistical software to estimate the models from real data.
4. Draw conclusions from the estimated models to solve the real life problems.

Course outcome \ Program Outcomes	1. identify, formulate solve engg prob by engg, sci & Math	2. produce solutions consider public health, safety, welfare, global, cultural, social, environ & economic	3 communicate with a range of audience	4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and societal context.	5. effective on a team provide leadership, collaborative and inclusive environ, plan tasks & meet objectives	6. develop and conduct experiment, analyze and interpret data & use engineering judgement to draw conclusions.	7. acquire and apply new knowledge using appropriate learning strategies
1. Formulate real life problems using regression and forecasting models	H						
2. Collect appropriate data to estimate the models and understand which data are useful in solving the problem						H	
3. Use statistical software to estimate the models from real data							
4. Draw conclusions from estimated models to solve real life problems	H						

**Evaluation of the important outcomes**

The outcome 1, 2 and 4 will be assessed by the project

**The approximate relationship from prior ABET a – k to new ABET 1 – 7.**

<p>OLD Criterion 3. Student Outcomes The program must have documented student outcomes that prepare graduates to attain the program educational objectives. Student outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program.</p>	<p>NEW Criterion 3: Student Outcomes The program must have documented student outcomes that support the program educational objectives. Attainment of these outcomes prepares graduates to enter the professional practice of engineering. Student outcomes are outcomes (1) through (7), plus any additional outcomes that may be articulated by the program.</p>
<p>(a) an ability to apply knowledge of mathematics, science, &amp; engineering  (e) an ability to identify, formulate, and solve engineering problems</p>	<p>(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.</p>
<p>(b) an ability to design and conduct experiments, as well as to analyze and interpret data</p>	<p>(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.</p>
<p>(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health &amp; safety, manufacturable, &amp; sustainable</p>	<p>(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration for public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.</p>
<p>(d) an ability to function on multidisciplinary teams</p>	<p>(5) An ability to function effectively on a team whose members together provide leadership, create a collaborative &amp; inclusive environment, establish goals, plan tasks, and meet objectives.</p>
<p>(f) an understanding of professional and ethical responsibility  (h) the broad education necessary to understand the impact of engg solutions in a global, economic, environmental, &amp; societal context  (j) a knowledge of contemporary issues</p>	<p>(4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.</p>
<p>(g) An ability to communicate effectively.</p>	<p>(3) An ability to communicate effectively with a range of audiences.</p>
<p>(i) a recognition of the need for, and an ability to engage in life-long learning</p>	<p>(7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.</p>
<p>(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</p>	<p>Implied in 1, 2 and 6</p>