# **MATH431**

**STUDENT WARNING:** This course syllabus is from a previous semester archive and serves only as a preparatory reference. Please use this syllabus as a reference only until the professor opens the classroom and you have access to the updated course syllabus. Please do NOT purchase any books or start any work based on this syllabus; this syllabus may NOT be the one that your individual instructor uses for a course that has not yet started. If you need to verify course textbooks, please refer to the online course description through your student portal. This syllabus is proprietary material of APUS.

# **Course Summary**

Course : MATH431 Title : Linear Regression II Length of Course : 8 Prerequisites : MATH325 Credit Hours : 3

# Description

**Course Description:** Linear regression models are widely used in business administration, economics, engineering, and the social, health, and biological sciences. Successful applications of these models require a sound understanding of both the underlying theory and the practical problems that are encountered in using the models in real-life situations. In this second linear regression course, students will focus on validating and creating linear models as a means to investigate the nature of the relationship between sets of predictor variables and a particular response variable. The emphasis will be on validating the utility and appropriateness of models used in a number of divergent application areas. Validation of regression model building assumptions will also be explored. Diagnostics and remedial measures, including transformations, will be examined. Specialized regression techniques will also be presented. (Prerequisite: MATH325)

### Course Scope:

This second course in linear regression will focus on several techniques in checking the adequacy of a linear regression model and investigating cases when diagnostics indicate that the regression model is not appropriate or that other (remedial measures) should be taken. Specialized topics in regression are introduced and examined to include autocorrelation in time series data, nonlinear regression, logistic regression, Poisson regression, and generalized regression models. Excel and Minitab will be used to construct, interpret, and validate models from a number of different application areas. Students must have access to Excel 2007 or later and Minitab 17 or later. This software is not provided by the course material grant and must be purchased or provided by the student. Prerequisites: MATH325, Linear Regression I

# **Objectives**

After completing the course, the student should be able to:

CO1. Analyze linear regression models to determine the nature of the relationship between sets of predictor variables and a particular response variable.

CO2. Assess the adequacy of a regression model.

CO3. Implement remedial measures associated with unequal error variances, multicollinearity, and inferential observation.

CO4. Analyze autocorrelation in time series data to determine the appropriateness of assumptions

made in business and economics applications.

CO5. Examine the appropriateness of nonlinear regression models

CO6. Analyze neural networks in modeling the response variable as a nonlinear function of various linear combinations of predictor variables

CO7. Apply logistic regression, Poisson regression, and general linear regression models as nonlinear regression models when response outcomes are discrete and error terms are not normally distributed.

# Outline

# Week 1: Model Adequacy and Identifying Outliers

Course Objective(s)

CO1, CO2

- Model Adequacy for a Predictor Variable

- Identify Outlying Y Observations
- Identify Outlying X Observations

Reading(s)

Read and study Chapter 10, Sections 10.1 - 10.3

Week 1 Lesson

Assignment(s)

First required contact. Introduce yourself on the Week 1 Introduction Forum and get to know your classmates

Review Problems: 10.5-10.7

Post questions or comments on the Q&A Forum.

#### Week 2: Remedial Measures and Bootstrapping

Course Objective(s)

CO1, CO3

- Unequal Error Variances Remedial Measures

- Multicollinearity Remedial Measures

- Influential Cases Remedial Measures Correlation Analysis

- Bootstrapping

Reading(s)

Read and study Chapter 11, Sections 11.1 – 11.3 and 11.5

Week 2 Lesson

Assignment(s)

Submit Interim Summary by 11:55 pm Eastern Time on Sunday.

Begin work on Discussion Question 1 (Due Wednesday, Week 3)

Review Problems: 11.6, 11.7

Post questions or comments on the Q&A Forum.

# Week 3: Autocorrelation and Forecasting Models

Course Objective(s)

CO1, CO4

- Autocorrelation
- Autoregressive Error Model
- Durbin Watson test
- Remedial Measures
- Forecasting

Reading(s)

Read and study Chapter 12,

Week 3 Lesson

Assignment(s)

Complete Discussion Question 1 by Wednesday of Week 3 (11:55 pm) and respond to at least 2 classmates by Sunday of Week 3(11:55 pm).

Complete Project #1 by 11:55 pm Eastern Time on Sunday of Week 3.

### **Review Problems:**

12.9, 12.10, 12.11

Post questions or comments on the Q&A Forum.

### Week 4: Examination 1

Course Objective(s)

CO1, CO2, CO3, CO4

Reading(s)

Read for review Chapter 10 Sections 10.1 – 10.3; Chapter 11, Sections 11.1 – 11.3 and 11.5; and Chapter 12

Assignment(s)

Complete Examination 1 by 11:55 pm Eastern Time on Sunday.

Submit Interim Summary by 11:55 pm Eastern Time on Sunday.

Begin work on Discussion Question 2 (Due Wednesday, Week 5)

Post questions or comments on the Q&A Forum.

### Week 5: Linear and Nonlinear Regression Models

Course Objective(s)

CO1, CO5

- Linear and Nonlinear Regression Models

Reading(s)

Read and study Chapter 13, Sections 13.1-13.4

Week 5 Lesson

Assignment(s)

Complete Discussion Question 2 by Wednesday of Week 5 (11:55 pm) and respond to at least 2 classmates by Sunday of Week 5 (11:55 pm).

Complete Project #2 by 11:55 pm Eastern Time on Sunday of Week 5.

Review Problems: 13.5, 13.6

Post questions or comments on the Q&A Forum.

#### Week 6: Neural Network Modeling

Course Objective(s)

CO1, CO6 - Neural Network Modeling

Reading(s)

Read and study Chapter 13, Section 13.6

Complete the Week 6 Lesson

Assignment(s)

Submit Interim Summary by 11:55 pm Eastern Time on Sunday.

Begin work on Discussion Question 3 (Due Wednesday, Week 7)

Review Problem: 13.5 and 13.6

Post questions or comments on the Q&A Forum.

# Week 7: Logistic, Poisson, and General Linear Regression Models

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Course Objective(s)

CO1, CO7

- Logistic Regression

- Poisson Regression

- Generalized Linear Models

Reading(s)

Read and study Chapter 14, Sections 14.1, 14.3- 14.4; 14.13, and 14.14

Week 7 Lesson

Assignment(s)
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Complete Discussion Question 3 by Wednesday of Week 7 (11:55 pm) and respond to at least 2 classmates by Sunday of Week 7(11:55 pm).

Complete Project #3 by 11:55 pm Eastern Time on Sunday of Week 7.

Review Problems: 14.7, 14.11, 14.38

Post questions or comments on the Q&A Forum.

#### Week 8: Examination 2

Course Objective(s)

CO1, CO5, CO6, CO7

Reading(s)

Read for review Chapter 13, Sections 13.1-13.4; Chapter 13, Section 13.6; Chapter 14, Sections 14.1, 14.3-14.4; 14.13, and 14.14

Week 8 Lesson

Assignment(s)

Complete Examination 2 by Sunday 11:55 pm Eastern Time.

Submit Interim Summary by 11:55 pm Eastern Time on Sunday.

Post questions or comments on the Q&A Forum.

# **Evaluation**

Staying on task and adhering to the published schedule are typically among the most challenging aspects of completing an academic course successfully. This is especially true for online and part-time non-resident programs. To avoid the pitfall of falling behind, students in this course should complete the assigned reading and complete all Lessons in a timely manner. Students should also complete the suggested Review Problem Sets as set forth in the schedule provided in the Course Outline of this syllabus. Review Problem Sets will not be graded, but their solutions will be available via the link in the Lessons section of our online classroom. Students should refer to these solutions as a means to confirm their understanding of the topics covered in the Review Problem Sets.

Students are urged to utilize the Q&A Forum as a means to interact with classmates. If questions or comments arise while working through examples or problems from the textbook, please post questions or comments in the Q&A Forum. Naturally, it is envisioned that the Q&A Forum will facilitate interactions among the students in the class. Please use the Q&A Forum to exchange supportive information pertaining to course concepts.

#### Forums:

<u>Forum Questions:</u> Students are urged to actively participate in the classroom forums in an effort to build a positive and effective learning environment. Please become familiar with relevant required readings, classroom questions or comments to make presentations more meaningful, relevant, and insightful. Whether helping someone understand a point, seeking clarification of a concept you may not completely understand, or contributing to the positive flow of the class discussion based on your experience, it is important for you to realize that learning is an action process—and sharing is a key ingredient in undertaking that process successfully. Class participation via the Forums during weeks 2, 4, and 6 is a course requirement and will count as 15 percent of the overall course grade (5% each). Students are required to respond to the questions posed in these Forums by making a post in the Forum by 11:55PM EASTERN time on Wednesday of weeks 3, 5, and 7. Grades for each forum are evaluated as follows: 70% response and 30% for responding to at least two classmates posting by Sunday of weeks 3, 5, and 7. the evaluation of student's discussion forum posts will be based on the extent to which students participate and foster a positive and effective learning environment-- for themselves and others. To make a post to a Forum, click on the Forum topic link, then click the Start a New Conversation link. In the title block of the dialog box that appears kindly insert your first and last name; compose your post in the message box; and then click Post Message. Submissions will not be accepted after the due dates.

Interim Summary Reports: The interim summary reports are another important part of this course. This report must be completed by the end of Weeks 2, 4, 6, and 8 of the course (Sunday, 11:59 pm Eastern Time or 2350 hours). Late assignments submissions will not be accepted. There are no exceptions to this policy. The interim summary is worth 10 percent of the course grade (2.5% each). A minimum of 250 words are required for the report. For the interim summary report, each student is required to complete a minimum of 150 word summary report to include the following as a minimum:

- What was learned over the previous weeks?
- Identification and presentation of a practical research application (not a problem) from the course materials covered during the period (detailed and concise presentation explaining goals, processes, and results)
- A summary of the student's thoughts on the material covered during the period.

<u>The Week 1 Introduction Forum</u>: During the first week of class each student must make a post to the Week 1 Introduction Forum. Students are requested to introduce themselves and state their goals and objectives as related to this course. Students are required to make a post to the Week 1 Introduction Forum in order to complete enrollment in the course. Student's post must be at least 250 words, and must be completed by the end of the first week. This is a university requirement. To make a post to the Week 1 Introduction Forum, click on the Forum topic link, then click Start a New Conversation. In the title block of the dialog box that appears kindly insert your first and last name; compose your post in the message box; and then click Post Message.

Besides completing your enrollment in the course, the Week 1 Introduction Forum is designed to 1) build peer-to-peer relationships by introducing oneself and one's background to the class; 2) to articulate individual student learning goals and/or expectations for the class. Therefore, in your introduction you may wish to touch upon the following:

- 1. Who you are and how you would like to be addressed.
- 2. Your academic major or program of study.
- 3. Your current status in your program of study.
- 4. Your academic goals including why you are taking this course and what you hope to achieve by completing it.
- 5. Other information about yourself that you would like to share

Three percentage points is awarded to every student making a post that promotes the aim of building peerto-peer relationships and articulates one's learning goals and aspirations with respect to this course.

<u>Projects</u>: Three projects, designed to give students an opportunity to apply the concepts discussed in this course will be utilized to evaluate performance in the course. Each project will account for 10% of your overall grade. Projects will be assigned as indicated on the course schedule and students are expected to complete them on time. No late submissions will be accepted.

Specific instructions will be provided for each project in the Lessons section of the classroom. Each project is to be completed on an individual basis. In completing the projects students may consult appropriate reference materials—and should use proper citations when doing so. However, the projects are to represent an individual effort. Therefore, **no collaboration is permitted on the projects**.

Project assignments will be posted in the Assignments section of the classroom. When students are prepared to submit a project, go to the Assignments section of the classroom and access the project writeup. Projects must be submitted by the 11:55PM Eastern Time deadline, as indicated in the syllabus. Late submission will not be accepted. Students are encouraged to not to wait until the last minute to submit projects.

<u>Examinations</u>: Two examinations will be utilized to evaluate a student's performance in the course. Each exam will account for 21% of the overall grade for the course. Exam 1 will cover topics in Weeks 1-3. Exam 2 will cover topics presented during Weeks 5-7. These exams will are due at the end of Week 4 and Week 8. Generally, the exams will contain problems similar to those discussed in the suggested homework problems and reflect the material presented in the textbook. However, students should expect to be challenged by the examinations. Students are expected to complete the exams by the due date. No late submissions will be accepted.

Specific instructions will be provided for each examination in the Lessons section of the classroom at the outset of the week in which the exams are due (Weeks 4 and 8). Each of these graded exercises is to be completed on an individual basis. Students may consult published textbooks, articles, and other printed materials. However, <u>no collaboration is permitted on the examinations</u>. Students are not to discuss, orally, in print, or online—in any manner—any aspect of the examinations with anyone other than the instructor.

At the beginning of the week in which they are due, exams will be posted in the Assignments section of the classroom. When students are prepared to take an examination, go to the Assignments section of the classroom and access the exam. It is important for students to understand that answers are submitted only once. Your answers must be submitted by the 11:55PM Eastern Time deadline, as indicated in the syllabus and the course calendar.

Students' final grades will be posted within 7 days of the end of the semester. Students should not telephone the university looking for grades until at least 30 days after the end of the semester. Please see the <u>Student</u> <u>Handbook</u> to reference the University's <u>grading scale</u>.

The final grade in the course will be based on two examinations, three projects, and three Forums and four interim summaries, as indicated below. Grades will be assigned based on the following scores:

#### Grading:

Nomo	Crode %
Name	Grade %
APUS Honor Code and Pledge	1.00 %
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Introduction Forum	2.00 %
Introduction	2.00 %
Interim Summary	10.00 %
Interim Summary Week 2	2.50 %
Interim Summary Week 4	2.50 %
Interim Summary Week 6	2.50 %
Interim Summary Week 8	2.50 %
Discussion Forums	15.00 %
Discussion Forum Week 3	5.00 %
Discussion Forum Week 5	5.00 %
Discussion Forum Week 7	5.00 %
Projects	30.00 %
Project #1	10.00 %
Project #2	10.00 %
Project #3	10.00 %
Examinations	42.00 %

# Materials

**Book Title:** Applied Linear Regression Models, 4th ed. - The VitalSource e-book is provided via the APUS Bookstore

Author: Kutner

Publication Info: McGraw-Hill

ISBN: 9781308043524

**Book Title:** You must validate your cart to get access to your VitalSource e-book(s). If needed, instructions are available here - http://apus.libguides.com/bookstore/undergraduate

Author: N/A

Publication Info: N/A

ISBN: N/A

Microsoft Excel and Minitab will be used for many of the computations and analyses required in the course. Students must have access to these software packages.

Students who do not already have access to Minitab can procure a free 30 day trial version or rent it at a greatly reduced student discount. Details can be found at the following URL:

 $\label{eq:http://e5.onthehub.com/WebStore/ProductsByMajorVersionList.aspx?cmi_mnuMain_child=2a1 143f0-74c7-e011-ae14-f04da23e67f6&cmi_mnuMain=2ff73789-74c7-e011-ae14-f04da23e67f6&ws=49c547ba-f56d-dd11-bb6c-0030485a6b08$ 

In addition to the required course textbook, public domain Websites might also prove to be useful. Please abide by the university's academic honesty policy when using Internet sources.

# **Course Guidelines**

### **Citation and Reference Style**

• Attention Please: Students will follow the APA Format as the sole citation and reference style used in written work submitted as part of coursework to the University. Assignments completed in a narrative essay or composition format must follow the citation style cited in the APA Format.

# Tutoring

<u>Tutor.com</u> offers online homework help and learning resources by connecting students to certified tutors for one-on-one help. AMU and APU students are eligible for 10 free hours\* of tutoring provided by APUS. Tutors are available 24/7 unless otherwise noted. Tutor.com also has a SkillCenter Resource Library offering educational resources, worksheets, videos, websites and career help. Accessing these resources does not count against tutoring hours and is also available 24/7. Please visit the APUS Library and search for 'Tutor' to create an account.

### Late Assignments

- Students are expected to submit classroom assignments by the posted due date and to complete the course according to the published class schedule. The due date for each assignment is listed under each Assignment.
- Generally speaking, late work may result in a deduction up to 15% of the grade for each day late, not to exceed 5 days.
- As a working adult I know your time is limited and often out of your control. Faculty may be more flexible if they know ahead of time of any potential late assignments.

### Turn It In

• Faculty may require assignments be submitted to Turnitin.com. Turnitin.com will analyze a paper and report instances of potential plagiarism for the student to edit before submitting it for a grade. In some cases professors may require students to use Turnitin.com. This is automatically processed through the Assignments area of the course.

#### **Academic Dishonesty**

• Academic Dishonesty incorporates more than plagiarism, which is using the work of others without citation. Academic dishonesty includes any use of content purchased or retrieved from web services such as CourseHero.com. Additionally, allowing your work to be placed on such web services is academic dishonesty, as it is enabling the dishonesty of others. The copy and pasting of content from any web page, without citation as a direct quote, is academic dishonesty. When in doubt, do not copy/paste, and always cite.

#### **Submission Guidelines**

• Some assignments may have very specific requirements for formatting (such as font, margins, etc) and submission file type (such as .docx, .pdf, etc) See the assignment instructions for details. In general, standard file types such as those associated with Microsoft Office are preferred, unless otherwise specified.

#### **Disclaimer Statement**

• Course content may vary from the outline to meet the needs of this particular group.

### **Communicating on the Forum**

- Forums are the heart of the interaction in this course. The more engaged and lively the exchanges, the more interesting and fun the course will be. Only substantive comments will receive credit. Although there is a final posting time after which the instructor will grade comments, it is not sufficient to wait until the last day to contribute your comments/questions on the forum. The purpose of the forums is to actively participate in an on-going discussion about the assigned content.
- "Substantive" means comments that contribute something new and hopefully important to the discussion. Thus a message that simply says "I agree" is not substantive. A substantive comment contributes a new idea or perspective, a good follow-up question to a point made, offers a response to a question, provides an example or illustration of a key point, points out an inconsistency in an argument, etc.
- As a class, if we run into conflicting view points, we must respect each individual's own opinion. Hateful and hurtful comments towards other individuals, students, groups, peoples, and/or societies will not be tolerated.

# **University Policies**

#### Student Handbook

Drop/Withdrawal policy

- Extension Requests
- <u>Academic Probation</u>
- Appeals
- Disability Accommodations

The mission of American Public University System is to provide high quality higher education with emphasis on educating the nation's military and public service communities by offering respected, relevant, accessible, affordable, and student-focused online programs that prepare students for service and leadership in a diverse, global society.

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