MATH340

Course Summary

Course : MATH340 **Title :** Multivariate Statistics
Length of Course : 8
Prerequisites : MATH302, MATH328 **Credit Hours :** 3

Description

Course Description: This course will introduce to students analysis of categorical data, log linear models for two- and higher-dimensional contingency tables, and logistic regression models. Also students will analyze aspects of multivariate analysis to include random vectors, random sampling, multivariate normal distribution, inferences about the mean vector and MANOVA. (Prerequisite: MATH328 AND MATH302)

Course Scope:

This course explores several multivariate statistical techniques used for analyzing complicated data sets. These techniques provide the foundation for analysis of data sets when many independent and/or many dependent variables are correlated with one another in various degrees. The growth in popularity associated with the analysis of "big" data using multivariate methods suggests those students who understand these techniques will be highly successful in this field of study. Students will use software programs to run multivariate models and discuss the results using charts, graphs, and numerical methods. Multivariable statistical concepts covered in this course include: Multiple Regression, Multivariate Analysis of Variance and Covariance, Logistic Regression, and Time-Series Analysis.

Objectives

After completing the course, the student should be able to accomplish these Learning Objectives (LO):

CO-1. Describe how multivariate statistics can be used in research design
CO-2. Map research questions with associated multivariate statistical techniques.
CO-3. Summarize important issues associated with screening data.
CO-4. Apply Multiple Regression techniques to real world research questions.
CO-5. Apply Multivariate Analysis of Variance and Analysis of Covariance to real world research questions.
CO-6. Apply Logistic Regression models to real world research questions.
CO-7. Apply Time-Series Analysis across multiple real world situations.

Outline

Week 1: Introduction to Multivariate Statistics, Guide to Statistical Terms, Introduction to Statistical Software

Learning Objective(s)

LO1.1 Discuss why Multivariate Statistics are used in research (CO1).

LO1.2 Apply statistical definitions and key terms to research involving multivariate statistical analysis (CO1).

LO1.3 Identify the degree of relationship among variables (CO1).

LO1.4 Map research questions to associated multivariate statistical techniques variables (CO2).

Reading(s)

Chapter 1

Chapter 2

Introduction to Statistical Software Part I

Assignment(s)

1. Students must introduce themselves to the class using the discussion thread created on the Discussion forum for Week 1 (30 points).

2. Students must read and study this syllabus. The syllabus is the guide to this course. If a student has a question, the question should be posted on the Week 1 Discussion forum as a separate thread.

3. Students must familiarize themselves with the classroom. The instructor will post a weekly announcement (first page seen upon entering the classroom). Students must review the Weekly Announcements for key items, guidance, and special assignments. Additionally students should be familiar with the Forums, Resources, tests and quizzes, and the Student Profile chapters of the online classroom. If a student does not understand how to use these chapters of the classroom, please use the Sakai tutorials.

4. Start Forum Discussion Question 1.

Week 2: Review of Univariate and Bivariate Statistical Processes, Screening and Cleaning Data

Learning Objective(s)

LO2.1 Discuss comparisons between Univariate and Bivariate Statistics with Multivariate Statistics to include parameter estimation and the effect of size used in research design (CO1).

LO2.2 Identify important issues associated with data screening (CO3).

LO2.3 Apply techniques of Data Screening to Data sets (CO3).

Reading(s)

Chapter 3

Chapter 4

Introduction to Statistical Software Part II

Assignment(s)

1. Read and study assigned chapters.

2. Complete Forum Discussion Question 1 no later than Wednesday of Week 2 and reply to at least two classmates' postings by Sunday of Week 2. (45 points)

3. Submit Project 1 by the end of the week (100 points)

Week 3: Multiple Regression

Learning Objective(s)

LO3.1 Identify kinds of research questions associated with Multiple Regression (CO1 and CO4).

LO3.2 Apply major types of Multiple Regression analyses to real world research questions (CO4).

Reading(s)

Chapter 5

Assignment(s)

1. Read and study assigned chapter.

2. Start Forum Discussion Question 2.

3. Complete the Interim Summary Report. (30 point)

4. Complete and submit Project 2 by the end of the week (100 points)

Week 4: Analysis of Covariance

Learning Objective(s)

LO4.1 Identify kinds of research questions associated with Analysis of Covariance (CO5).

LO4.2 Cite important issues and limitations associated with Analysis of Covariance (CO5).

LO4.3 Apply Analysis of Covariance to real world research questions (CO5).

Reading(s)

Chapter 6

Assignment(s)

1. Read and study assigned chapter.

2. Complete Forum Discussion Question 2 no later than Wednesday of Week 4 and reply to at least two classmates' postings by Sunday of Week 4. (45 points)

Week 5: Multivariate Analysis of Variance and Covariance

Learning Objective(s)

LO5.1 Identify kinds of research questions associated with Multivariate Analysis of Variance and Covariance (CO5).

LO5.2 Cite important issues and limitations associated with Multivariate Analysis of Variance and Covariance (CO5).

LO5.3 Apply Multivariate Analysis of Variance and Covariance to real world research questions (CO5).

Reading(s)

Chapter 7

Assignment(s)

1. Read and study assigned chapter.

2. Start Forum Discussion Question 3.

3. Complete the Interim Summary Report 2. (30 point)

4. Complete Project 3 by end of this week. (100 points)

Week 6: Logistic Regression

Learning Objective(s)

LO6.1 Identify kinds of research questions associated with Logistic Regression (CO6).

LO6.2 Identify the types of Logistic Regression (CO6).

LO6.3 Cite important issues and limitations associated with Logistic Regression (CO6).

LO6.4 Apply Logistic Regression to real world research questions (CO6).

Reading(s)

Chapter 10

Assignment(s)

1. Read and study assigned chapter.

2. Complete Forum Discussion Question 3 no later than Wednesday of Week 6 and reply to at least two classmates' postings by Sunday of Week 6. (45 points)

3. Complete and turn in Project 4 by the end of the week. (100 points)

Week 7: Time Series Analysis

Learning Objective(s)

LO7.1 Identify kinds of research questions associated with Time-Series Analysis (CO7).

LO7.2 Identify theoretical and practical assumptions of Time-Series Analysis (CO7).

LO7.3 Identify the types of Time-Series Analyses and important issues associated with the use of each type (CO7).

LO7.4 Apply Time-Series Analysis to real world research questions (CO7).

Reading(s)

Chapter 18 (viewed online)

Assignment(s)

1. Read and study assigned chapter.

2. Begin work on Forum Discussion Question 4.

3. Complete the Interim Summary Report. (30 points)

4. Complete Project 5 by end of this week. (100 points)

Week 8: Final Examination

Learning Objective(s)

Course Objectives CO-1 through CO-7

Demonstrate knowledge of Multivariate Statistics as presented in this course

Reading(s)

Review the following Chapters

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

Chapter 7

Chapter 10

Chapter 18

Assignment(s)

1. Prepare for the Final Examination. Students should allot 3 hours of uninterrupted internet time to complete the final exam. Additionally, Students should review any special instructions issued by the instructor.

2. Complete Forum Discussion Question 4 no later than Wednesday of Week 8 and reply to at least two classmates' postings by Sunday of Week 8. (45 points)

3. Take the 3 hour Final Examination. All exams must be taken prior to the last day of the class. No exams will be administered or accepted after the last day of class unless a student has a valid approved extension. **(Students are reminded that if an extension is required, it must be <u>submitted and approved</u> by the last day of class. Please allow a minimum of two days prior to the last day of class to submit for an extension. Students should not attempt to submit for an extension within the last two days of class end. It may not be approved and returned to the student requesting additional information or specific and detailed dates regarding completion of outstanding course requirements. No extensions will be granted once the semester has ended).**

4. Complete Final Examination by 11:55 PM Eastern time on the last day of the semester. (200 points)

Evaluation

Course grading will be based on Forums participation (includes discussion questions, weekly summaries, and other data analysis activities), five graded data projects, and a final examination.

Forums:

Discussion Forum Questions: There will be discussion questions established for Weeks 1, 3, 5, and 7. Students responses are due 11:59 pm, Wednesdays of Weeks 2, 4, 6, and 8. Responses to a minimum of two classmates postings are due 11:59 pm, Sundays of Weeks 2, 4, 6, and 8. Maximum assessment for each week is 4 percentage points of the course grade (3.5 for response and .5 for comments to classmates) for a total of 14 out of 100 points. Each student is required to participate in the discussion question forum; initial responses will not be accepted or be given credit after the due date. Participation (submission of response) outside of any particular week will not be given credit. There are no exceptions to this policy. Additionally, students will not be able to pre-post forum discussion questions.

Interim Summary Reports: The interim summary reports are the second component of class participation. This report must be completed by the end of Weeks 3, 5, and 7 of the course (Sunday, 11:59 PM Eastern Time or 2350 hours). Late assignments will not be accepted. There are no exceptions to this policy. Maximum assessment for each weekly summary report is 20 points of the course grade for a maximum of 60 points. 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 since last interim summary; identification and presentation of a practical research application (not a problem) from the course materials covered during the period; and a summary of the student's thoughts on the material covered during the period.

In addition, student should share links to any web sites used to help support learning and understanding of the materials for that week (outside of the tutorials). Student's interim reports will be evaluated for clarity, quality, content, and proper use of terms, spelling, and grammar. Students will post their summaries in the forum for Interim Summary Reports for weeks 3, 5, and 7. Interim Summary Reports posted in forums other than the Interim Summary Reports Forum will not be accepted or graded; there are no exceptions to this policy. Summaries must be posted as a separate thread. If not posted as a separate thread, it will not be accepted or graded. Each student is encouraged to comment on other students summaries. Additionally, students are not to use the summary to ask questions; questions should be posted in the "Q &A" Forum.

Other instructor directed activities: If required, the instructor will post additional activities and they will be noted in the Weekly Announcement. The weekly discussion forum is a tool for the students to use to communicate their questions and comments. Please make full use of the discussion forum by asking questions or making comments on the materials covered during any particular week. Do not ask for assistance on particular quiz or exam questions unless it is for clarification.

Data Analysis Projects: The five graded Data Analysis projects are dispersed throughout the course (see course schedule). They are worth 15 points each. These projects are posted in the Assignments Forum. Student will use the data sets available and demonstrate their knowledge of the subject matter when completing the projects. Students will receive feedback on the project and may be asked to provide updates on incomplete or incorrect analysis. Students may use text and notes in completing the projects, but no help from anyone else.

Final Exam: The Final Exam will be taken during the last week of the semester. It will be a three hour online exam. The Final Exam will be worth 19 percentage points toward student's final course grade. The final exam will cover all materials in the course. Students will have 3 hours to complete the 20 question exam. (Students should make sure that adequate time is allocated to take the exam). The final exam will not be a proctored exam. Students may use the textbook and notes in completing the final

exam, but no help from anyone.

Students' final grades will be posted as soon as the instructor receives and evaluates the Final Exam. Official grades will continue to be issued by the University on the grade report form. Professors have 7 days from the end of the semester to submit their grades to the University.

Please see the Student Handbook to reference the University's grading scale.

The points earned on the graded course assignments will determine the course grade. The final grade in the course will be based on total points. Grades will be assigned based on the following composite scores:

Grading:

Name	Points
APUS Honor Code and Pledge	0
APUS Honor Code and Pledge	10
Introduction Froum	0
IntroductionForum	30
Weekly Forums	0
Discussion Forum 1	45
Discussion Forum 2	45
Discussion Forum 3	45
Discussion Forum 4	45
Interim Summary Reports	0
Interim Summary Week 03	30
Interim Summary Week 05	30
Interim Summary Week 07	30
Projects	0
Project 1	100
Project 2	100
Project 3	100
Project 4	100
Project 5	100
Final Exam	0
Final Exam	190

Materials

Book Title: Using Multivariate Statistics, 6th Ed - The VitalSource e-book is provided via the APUS Bookstore

Author: Barbara G. Tabachnick, Linda S. Fidell

Publication Info: Pearson

ISBN: 9780205849574

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

Additional Resources: Students will be provided access to a statistical software package in order to input data and complete analysis using the techniques presented in class..

Tutorials: Additional online help involving mathematical concepts associated with topics in lower level Mathematics courses is available through the University. Please go to the web page at http://www.apus.edu/media/mathWV/index.htm to view the mathematics tutorials. These tutorials include 4-6 minute vignettes. Students may access these videos from the links in the Course Outline above by clicking on *Ctrl+Click* on the link.

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

- Tutor.com 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](#)

- [Academic Probation](#)

- [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.