

### **SIE 432/532 Sports Analytics**

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### **Course Description**

The popularity of analytics in sports is at an all-time high, opening up opportunities for new ways of analyzing data and making decisions to gain competitive advantage. In order to understand data beyond just numbers we must be able to tell a story. Classical statistical methods combined with modern data science tools can be used to communicate effectively and influence decisions in sports organizations. This course will focus on critical thinking, statistical methods for data analytics, and data visualization to support data-driven decisions in sports.

The primary sports discussed in this course will be baseball, football, and basketball. Special emphasis will be on professional and collegiate sports because of the availability of data. However, students are encouraged to pursue their interests in other sports by applying the methods covered in class to their topic of choice.

### **Prerequisite**

SIE 305 Introduction to Engineering Probability and Statistics or equivalent preparation

### **Learning Outcomes**

By taking this course students will have the ability to:

1. Identify sources of data for various sports
2. Understand a variety of statistical techniques and their limitations
3. Define well-posed statistical questions and identify the necessary data to answer them
4. Apply the necessary software tools to manage and analyze data
5. Implement storytelling with data techniques
6. Write software code in order to filter, manipulate, and understand large data sets
7. Transfer methods to non-sports contexts
8. Learn how analytics are used by coaches at the collegiate and professional levels

### **ABET Student Outcome**

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

### **Learning Management System**

All course materials will be available in UA's Learning Management System Desire 2 Learn (aka "D2L") <https://d2l.arizona.edu>. All homework assignments and final projects must be submitted via D2L in order for instructor to grade them.

### **Absence and Class Participation Policies**

Since this is an in-person class, participation is key to earning points. There will be no zoom meetings or recorded classes.

- Absences for any sincerely held religious belief, observance, or practice will be accommodated where reasonable. Refer to the [Religious Accommodation Policy](#).
- Absences pre-approved by the University Dean of Students (or dean's designee) will be honored.

### **Required Texts**

Winston, W., *Mathletics: How Gamblers, Managers, and Sports Enthusiasts Use Mathematics in Baseball, Basketball, and Football*, Princeton University Press, 2009.

<https://ebookcentral.proquest.com/lib/uaz/detail.action?docID=832770>

Knaflic, C., *Storytelling With Data*, Wiley, 2015.

<https://ebookcentral.proquest.com/lib/uaz/detail.action?docID=4187267>

Lewis, M., *Moneyball: The Art of Winning and Unfair Game*, WW Norton, 2004.

### **Optional Readings**

Marchi, M. and Albert, J., *Analyzing Baseball Data with R*, Chapman & Hall/CRC, 2013.

*Journal of Sports Analytics* <http://journalofsportsanalytics.com>

New England Symposium on Statistics in Sports <http://www.nesis.org>

### **Required Software**

Assignments that require the analysis of data will be done utilizing MS Excel (with Analysis ToolPak) and R (programming language and software environment for statistical computing and graphics). For the final project, those who prefer to use Python (programming language for data analytics) or other comparable languages are welcome to do so.

### **Required Extracurricular Activities**

There is a required field trip to Chase Field in Phoenix on Friday May 26 to attend the baseball game between the Arizona Diamondbacks and the Boston Red Sox. Tickets and transportation will be provided by the University of Arizona. Students will be responsible for purchasing food.

The time commitment that day will be 10 hours: starting at 2 PM (bus departure from UA campus) and ending at 12 AM (bus return to UA campus).

### Grading Scale and Grade Policies

Course grades for undergraduate section will be determined based on the following items:

Course Work	Points	Percentage
Homework (5 at 3 pts. each)	15	15%
Quizzes (5 at 3 pts. Each)	15	15%
Field Tip Reflection	15	15%
Book discussions	15	15%
Final Project	40	40%
<b>TOTAL</b>		<b>100%</b>

Course grades for graduate section will be determined based on the following items:

Course Work	Points	Percentage
Homework (5 at 3 pts. each)	15	15%
Quizzes (5 at 3 pts. Each)	15	15%
Field Tip Reflection	15	15%
Book discussions	15	15%
Final Project	40	40%
<b>TOTAL</b>		<b>100%</b>

The grading scheme will follow the distribution below.

Points	Percentage	Letter Grade
90-100	90%-100%	<b>A</b>
80-89	80%-89%	<b>B</b>
70-79	70%-79%	<b>C</b>
60-69	60%-69%	<b>D</b>
<60	<60%	<b>E</b>

If you experience extraordinary circumstances beyond your control, which prevent you from completing the course within the scheduled timeframe, you must request an incomplete by emailing the instructor **before the end of the course**. Please clearly explain the reasons for the request and provide relevant documentation. Please be aware that you must (1) have a passing grade and (2) have the majority of course requirements completed at the time of the request. If granted an incomplete, you should review the related policy stipulations at <https://www.registrar.arizona.edu/grades/incomplete-i-grade>

### **Threatening Behavior Policy**

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See

<http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

### **Academic Integrity Policy**

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the result of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See

<https://deanofstudents.arizona.edu/student-rights-responsibilities/academic-integrity>.

### **Nondiscrimination and Anti-harassment Policy**

The University is committed to creating and maintaining an environment free of discrimination;

see <http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

### **Accommodations for Students with Disabilities**

At the University of Arizona we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520) 621-3268, <https://drc.arizona.edu/>) to establish reasonable accommodations.

### **Subject to Change Statement**

Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.