ITP 249: Introduction to Data Analytics
Units: 4, Spring 2024

TTh 5:30 – 7:20 pm, THH 212 (31810R)

Instructor: Patrick Alexander
Office Hours: To posted on Blackboard
Contact Info: Patrick.Alexander@usc.edu

Teaching Assistants:
TA Office hours: To posted on Blackboard

IT Help:
USC IT (ITS): https://itservices.usc.edu/contact/
Viterbi IT: https://viterbi.usc.edu/resources/vit/contact-us.htm

Course Description
Data is now an integral part of our lives and to be successful in today's business landscape, we need to be able to leverage data to make critical business decisions. This course will teach students how to use data to make those decisions confidently.

Learning Objectives
After completing this course, students will be able to:
- Use Excel, SQL, NoSQL and leading industry tools
- Collect, clean, and analyze data from multiple sources
- Pose questions, collect relevant data, analyze data, interpret data and provide insights
- Present data-driven insights using data visualization and dashboards

Prerequisite(s): None

Course Notes
Lecture slides and any supplemental course content will be posted to Blackboard. All announcements for the course will be posted to Blackboard. Information about assignments, due dates, exams and grades will also be posted on Blackboard. Students should check Blackboard regularly for updates.

Zoom?
There will be no remote attendance option, nor will there be any recordings of the lecture. Students are expected to attend lectures in-person.

Technological Proficiency and Hardware/Software Required
Most assignments in the class are done using software. Software will be provisioned for download or available through a virtual lab. Students are expected to have access to a computer. ITP has a limited number of laptops that students can request to borrow.

Optional Books
Carlos Coronel, Steven Morris. *Database Systems: Design, Implementation, and Management*. Boston, MA: Cengage Learning, 2018. ISBN-13: 978-1337627900

Additional reference material will be provided in class as needed.

Description and Assessment of Assignments

This course will make use of Blackboard for assignments. All assignments will be posted on Blackboard. Assignment will include instructions, a due date, and a link for electronic submission. Assignments must be submitted using this link.

Grading Breakdown

The weight of the graded material during the semester is listed below:

Item	% of Grade
Individual Assignments	25
Group Projects	15
Exam I	30
Exam II	30
Total	**100**

Grading Timeline

Assignments Grading will typically be completed 7 days after submission. Any variations will be announced in class or on blackboard. All grading discrepancies must be resolved within a week of grade release.
For grade disputes, contact your grader first. If resolution is not reached, contact the instructor.

Grading Scale

Course final grades will be determined using the following scale:

Letter grade	Corresponding numerical point range
A	>= 93
A-	>= 90 and < 93
B+	>= 87 and < 90
B	>= 83 and < 87
B-	>= 80 and < 83
C+	>= 77 and < 80
C	>= 73 and < 77
C-	>= 70 and < 73
D+	>= 67 and < 70
D	>= 65 and < 67
F	< 65

For the Pass/No Pass grading option, you must earn at least 70% to pass.

Projects

Students can choose to work alone or with one other group member. Groups will be formed after the first Exam.

Software

List of software that will be used in the course. Software will be provisioned through a virtual lab or available for free trial download
- MySQL, MySQL Workbench
- MongoDB, Studio3T
- Neo4J
- Tableau

Policies

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Students are expected to attend and participate in lecture discussions, in-class exercises and group meetings.

Students are responsible for completing individual assignments as well their fair share of team projects by stated deadlines. Assignments turned in late will have 25% of the total points deducted from the graded score for each late day. ***Students are given three "grace" days for the semester (only for Homework). Other late submissions will be penalized, with no exceptions. Projects do not have grace days.***

No make-up exams (except for documented medical or family emergencies and religious holy days) will be offered. If they will not be able to attend an exam due to an athletic game or other valid reason, then they must coordinate with the instructor before the exam is given. They may arrange to take the exam before they leave, with an approved university personnel during the time they are gone, or within the week the exam is given. If students do not take an exam, then they will receive a 0 for the exam.

If students need accommodations authorized by OSAS, notify the instructor at least two weeks before the exam. This will allow time for arrangements to be made.

Course Content Distribution and Synchronous Session Recordings Policies
USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. (Living our Unifying Values: The USC Student Handbook, page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. (Living our Unifying Values: The USC Student Handbook, page 13).

Policy on the use of AI generators
In this course, I encourage you to use artificial intelligence (AI)-powered programs to help you with assignments that indicate the permitted use of AI. You should also be aware that AI text generation tools may present incorrect information, biased responses, and incomplete analyses; thus, they are not yet prepared to produce text that meets the standards of this course. To adhere to our university values, you must cite any AI-generated material (e.g., text, images, etc.) included or referenced in your work and provide the prompts used to generate the content. Using an AI tool to generate content without proper attribution will be treated as plagiarism and reported to the Office of Academic Integrity. Please review the instructions in each assignment for more details on how and when to use AI Generators for your submissions.

Course Schedule: A Weekly Breakdown

	Topics	Reading	Homework
Week 1	**The Value of Data** • Explanation of course objectives and tools • Syllabus Review • Discussion of the value and impact of data-driven decision making • Discussion of visual analytics and common presentation strategies • Excel Analytics • Brief history of databases and their role in information systems • Different types of databases and their organizational context • Survey of DBMS	• Week 1 - Lecture 1 – Introduction • Week 1 - Lecture 2 - Introduction to Data	• Assign HW1
Week 2	**Foundations of Databases and SQL** • Data Modeling • Data models • Business rules • Relational and entity-relationship modeling • Entities, attributes, relationships • Keys: primary, foreign, candidate, surrogate, super • Minimum and maximum cardinality	• Week 2 - Lecture 3 - Data modeling	• Assign HW2
Week 3	**Normalization** • Anomalies and the need for normalization • Normal forms • First, second, third normal forms • Denormalization • Dependency Diagrams	• Week 3 - Lecture 4 - Normalization	• Due HW1 & HW2 • Assign HW3
Week 4	**Introduction to SQL** • Database structures • Introduction to SQL's SELECT statement with WHERE clauses • Query command tools: GROUP BY, HAVING, DISTINCT, COUNT, AND, and OR • Conditional operators: =, !=, >, <, IN, NOT IN, and BETWEEN • Aggregation functions: MIN, MAX, SUM, AVG, and COUNT	• Week 4 - Lecture 5 - SQL 1 • Week 4 - Lecture 6 - SQL 2	• Due HW3 • Assign HW4
Week 5	**Combining Data in SQL** • Appending similar data together • Combining data from different tables together • Commands for combining data: JOIN and UNION **Creating Multiple Joins**	• Week 5 - Lecture 7 - SQL 3 • Week 5 - Lecture 8 - SQL 4	• Due HW4 • Assign HW5

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	• Creating relationships between tables: INNER, RIGHT, FULL OUTER, EXCEPTION and CROSS JOINs • Optimizing queries: WHERE, LIMIT and COALESCE		
Week 6	**Subqueries** • Asking multiple questions in a single query • Nesting queries • Multi-step aggregation or filtering	• Week 6 - Lecture 9 - SQL 5	• Due HW 5 • Assign HW6
Week 7	**Subqueries** • Asking multiple questions in a single query • Nesting queries • Multi-step aggregation or filtering	• Week 7 - Lecture 9 - SQL 5	• Due HW6 •
Week 8	**Exam I**		•
Week 9	**Data Visualization** • Introduction to Charting techniques • Type of variables: Categorical, numerical • Tableau	• Week 9 - Lecture 10 - Data Visualization	• Assign Proj1
Week 10	**NoSQL** • Drawbacks of SQL • Why NoSQL • Introduction to MongoDB • Non-relational databases	• Week 10 - Lecture 11 - NOSQL	•
Week 11	**Fundamentals of MongoDB** • Data storage • Data Retrieval **MongoDB** • Queries	• Week 11 - Lecture 12 - MONGO-1	• Due Proj1
Week 12	**MongoDB** • Aggregation Framework	• Week 12 - Lecture 13 - MONGO-2	• Assign Proj2
Week 13	Graph DBs • Why graph database? • Introduction to Neo4J Working with graph databases • Querying	• Week 14 - Lecture 14 - Graph db and Neo4j • Week 13 - Lecture 15 - Cypher neo4j	•
Week 14	Graph Visualization, Machine Learning	•	• Due Proj2 • Assign Proj3
Week 15	**Exam II**	•	•
Week 16	**Project due**	•	• Due Proj3

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Important Session Dates: (Registration Calendar)

Oct. 23-Jan. 5	Registration for continuing students
Nov. 16-Jan. 5	Registration for returning and new students
Jan. 2-5	Registration for spring semester continues
Jan. 5	**Last day to register and settle without late fee**
Jan. 8	Spring semester classes begin for Session 001
Jan. 8-12	Late registration and change of program for Session 001
Jan. 15	Martin Luther King Day, university holiday
Jan. 26	**Last day to register and add classes for Session 001**
Jan. 26	**Last day to drop a class without a mark of "W," except for Monday-only classes, and receive a refund for Session 001**
Jan. 26	**Last day to change enrollment option to Pass/No Pass or Audit for Session 001**
Jan. 26	**Deadline for purchasing or showing proof of health insurance**
Jan. 26	**Last day to purchase or waive tuition refund insurance**
Jan. 30	**Last day to add/drop a Monday-only class without a mark of "W" and receive a refund or change to Pass/No Pass or Audit for Session 001**
Feb. 19	Presidents' Day, university holiday
Feb. 23	**Last day to drop a course without a mark of "W" on the official transcript only.** **Mark of "W" will still appear on student record and STARS report and tuition charges still apply.** ***Please drop any course by the end of week three for session 001 (or the 20 percent mark of the session in which the course is offered) to avoid tuition charges.**
Feb. 23	**Last day to change a Pass/No Pass to a letter grade for Session 001.**
March 11-15	Spring recess
April 6	**Last day to drop a class with a mark of "W" for Session 001**
April 26	Spring semester classes end
April 27-30	Study days
May 1-8	Final examinations
May 9	Spring semester ends
May 10	Commencement

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Adding the Course after Week 1

Per university policy, students are allowed to add the course until June 2nd. Any students wishing to add the course should plan on attending the course from the beginning of the semester. Upon adding the course after week 1, the student should email the instructor immediately to make a plan for completion of work and learning missed materials. Any missed work is required to be completed and submitted according to the schedule provided by the instructor. If you register for the class after assignments/exercises are due, then you will need to coordinate with the instructor to determine appropriate deadlines for the missed assignments/ exercises.

Attendance

Attendance is not part of the grading breakdown, although attending lectures will help you to participate in the exercises and learn the material and succeed in this class. If you are not able to attend, then it is your responsibility to catch up with the material and complete the requirements. Lectures are not recorded.

Communication

The preferred way to communicate with instructors and TAs is posting on Piazza (https://piazza.com/). All ITP249 students, and TAs will have access to the same discussion board. Information about accessing Piazza is available on Blackboard. If you have questions about Homework, Projects, exams, and other aspects about this course, please post on Piazza. You are able to make public posts that all members can see and answer or private posts to individuals, which are only accessible to the instructor and LAs. Please do not use emails. Students should NOT directly email the TAs or graders: all correspondence with the TAs should be done on Piazza.

Statement on Academic Conduct and Support Systems

Academic Integrity:
The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, compromises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the student handbook or the Office of Academic Integrity's website, and university policies on Research and Scholarship Misconduct.

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:
USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - *(213) 740-9355 – 24/7 on call*
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

988 Suicide and Crisis Lifeline - *988 for both calls and text messages – 24/7 on call*
The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services

(though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

Relationship and Sexual Violence Prevention Services (RSVP) - *(213) 740-9355(WELL) – 24/7 on call*
Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - *(213) 740-5086*
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - *(213) 740-5086 or (213) 821-8298*
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - *(213) 740-0776*
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - *(213) 740-0411*
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - *(213) 740-2101*
Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - *UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call*
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - *UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call*
Non-emergency assistance or information.

Office of the Ombuds - *(213) 821-9556 (UPC) / (323-442-0382 (HSC)*
A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - *(323) 442-2850 or* otfp@med.usc.edu
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

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