



School of Engineering
*Information
Technology Program*

ITP 487 – Enterprise Data Analytics

Units: 4

Spring 2022, 10-11:50AM MW @ CPA 150

Spring 2022, Noon–1:50PM MW @ CPA 150

Spring 2022, 2-3:50PM MW @ CPA 150

Location: In-Person & Online Available

Instructor: Mike Lee

Contact Info: mikelee@usc.edu

Office Hours: bit.ly/professorlee

Teaching Assistants: bit.ly/professorlee

IT Help:

USC IT (ITS): <https://itservices.usc.edu/contact/>

Viterbi IT: <https://viterbi.usc.edu/resources/vit/contact-us.htm>

Course Description

While the increased capacity and availability of data gathering and storage systems have allowed enterprises to store more information than ever before, most organizations still lack the ability to effectively consolidate, arrange, and analyze this vast amount of data. Analyzing large data sets to forecast and predict future events has become a highly sought-after skill in business, engineering, services, science, health, and other industries.

This course will explore the theory and practice of the following areas:

- Enterprise Strategy & Decision Making
- Data Analytics for Enterprises
- Enterprise Data Warehouses
- Business Forecasting

Learning Objectives

After completing the course, students will be able to

- Understand the organizational structure of enterprises (large organizations)
- Understand how enterprises make major technology decisions
- Define enterprise data analytics and its drivers
- Describe the components of an enterprise data warehouse
- Model the relational database required for an enterprise data warehouse
- Extract, cleanse, consolidated, and transform heterogeneous data into a single enterprise data warehouse
- Analyze data to generate information and knowledge that lead to informed decisions for businesses
- Describe the various forecasting techniques
- Gain hands on experience in career relevant tools

Prerequisite(s): ITP 320 or ITP 249

Course Notes

All course materials will be made available through Blackboard. These include:

- Lecture slides
- In-class exercises
- Homework assignments
- Readings
- Software details and instructions for accessing Viterbi Virtual Lab
- Grades and feedback
- Office hours
- Online discussion forums will be used for out-of-class discussions

Announcements made in class and content posted in Blackboard will supersede the contents of this syllabus.

USC Technology Support Links

[Zoom information for students](#)

[Blackboard help for students](#)

[Software available to USC Campus](#)

Technological Proficiency and Hardware/Software Required

The assignments for this class will include both reading assignments as well as hands-on computer assignments. Students must bring their laptop computers (phones/tablets are not sufficient) to lecture sessions to participate in hands-on activities. Students will be given tutorials to gain familiarity with software tools.

Most of the enterprise software required for the class is Windows based or delivered via the cloud. The software will be provisioned through the Viterbi Virtual Lab, Amazon Web Services, Google Cloud, and/or installed your computer. Specifically, students will be using:

- SAP BW/4HANA (Business Warehouse)
- Eclipse with SAP BW Modeling Tools Plugin
- SAP Analysis for Microsoft Excel
- SAP Predictive Analytics*
- Teradata*
- Microsoft Excel
- Microsoft Power BI*
- Amazon Web Services (RDS)
- Google Cloud (Google Colab)
- Python (Notebook/Pandas)
- MySQL
- SQL

* may be replaced with an alternative technology

VITERBI VIRTUAL LAB – VMWARE VDI

All software can also be accessed into Virtual Desktop by logging in at: <http://mydesktop.vlabs.usc.edu>. See blackboard for additional instructions on installing.

Alternatively, you can install the required software on your Windows machine (no support will be provided). Instructions will be posted on Blackboard.

Readings and Supplementary Materials

Reading and supplementary materials will be announced in class and published on Blackboard.

Optional: Practical Analytics, Nitin Kale and Nancy Jones, Second Edition, Epistemy Press 2020
<http://store.epistemypress.com/books/analytics.html>

Description and Assessment of Assignments

Homework: Most homework is computer based. Homework should be turned in to Blackboard. Grading will be based on completeness, accuracy, and timeliness. Feedback will be provided through Blackboard. These are individual effort assignments. *One homework assignment will be dropped (lowest score) from your grade calculation.*

In-Class Exercises: are guided Q&A and hands-on exercises that are used to spark additional discussion and deeper understanding of the materials and concepts before the student leaves the class. Announcement of in-class exercises may or may not be given prior to the class. In-class exercises can be a team or individual exercises. The score used for grading is the percentage of in-class exercises completed and turned in in-class vs what was assigned in the semester. *Two in-class exercises will be dropped (lowest scores) from your grade calculation.*

Exams: Online using Blackboard. Details will be posted on Blackboard.

Final Project: Final project is an individual summative assignment where you will be applying most of the skills that you have learned through the semester.

Grading Breakdown

Homework	30%
In-Class Exercises	10%
Exam I	25%
Exam II	25%
Final Project	10%
TOTAL	100%

Grading Scale

Final grades represent how you perform in the class relative to other students. Historically, the average grade for this class is about a 3.4.

Grading Timeline

Grading will typically be completed 7 days after submission. Any variations will be announced in class or on blackboard.

Policies

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

Assignments turned in late will have 25% of the total points deducted from the graded score for each late day.

No make-up exams (except for documented medical or family emergencies) 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. Accommodations religious observance must be arranged with the Professor at least two weeks before the exam.

If students need accommodations authorized by OSAS (Office of Student Accessibility Services), notify the instructor at least two weeks before the exam. This will allow time for arrangements to be made.

Zoom synchronous sessions will be recorded and provided to all students asynchronously.

Sharing of course materials outside of the learning environment

SCampus Section 11.12(B)

Distribution or use of notes or recordings based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study is a violation of the USC Student Conduct Code. This includes, but is not limited to, providing materials for distribution by services publishing class notes. 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. (See Section C.1 Class Notes Policy).

Course Schedule:

	Topics/Daily Activities	Due Dates
Week 1 – Jan 10	<p>Course Introduction</p> <ul style="list-style-type: none"> • Course objectives and outcomes • What is enterprise data analytics? • Why do we need enterprise systems? • Data analytics approach • What is a data warehouse? • Various types of data repositories <p>Enterprise Overview</p> <ul style="list-style-type: none"> • Structure of enterprises • CIO reporting structure • Technology decision making • Components of a strategy 	Check Blackboard for assignments, readings and due dates
Week 2 – Jan 17	<p>NO CLASS 1/17 – MARTIN LUTHER KING BIRTHDAY</p> <p>Data Concepts</p> <ul style="list-style-type: none"> • Structured vs Unstructured Data • Type vs Instance • Tabular vs Multi-Dimensional Data • Physical vs Virtual • Master Data vs Transactional Data • Big Data vs Enterprise Data <p>Relational Database Review</p> <ul style="list-style-type: none"> • Entity Relationship Diagrams • Relations, attributes, relationships 	
Week 3 – Jan 24	<p>Relational Database Review (cont)</p> <ul style="list-style-type: none"> • SQL • JOINS <p>Data Warehouse Fundamentals</p> <ul style="list-style-type: none"> • Data Warehouse Components • Types and sources of data • Transactional (OLTP) vs. Informational systems (OLTP) • Enterprise data warehouses • Data warehouse process • Data store objects 	
Week 4 – Jan 31	<p>Data Warehousing Fundamentals – Dimensional Modeling</p> <ul style="list-style-type: none"> • Multidimensional model for data warehouses 	

	<ul style="list-style-type: none"> • Star Schema • Dimension and fact tables • Snowflake Schema • Difference between star schema and snowflake schema <p>Data Warehouse Fundamentals – Master Data</p> <ul style="list-style-type: none"> • Master data tables • Attributes – Display, Navigational • Texts • Hierarchies 	
Week 5 – Feb 7	<p>Data Warehouse Implementation</p> <ul style="list-style-type: none"> • SAP HANA Database • SAP BW/4HANA • SAP BW Key Components <p>InfoObjects: Warehouse Catalog</p> <ul style="list-style-type: none"> • Characteristics and key figures • Creating InfoObjects • Handling aggregations – Standard and exception • Handling time dependency • Handling language dependency 	
Week 6 – Feb 14	<p>Master Data: Data Flow Objects</p> <ul style="list-style-type: none"> • Moving data through the data warehouse • ETL • Process chains • Master data loading into characteristics <p>InfoProviders: Data Containers/Views</p> <ul style="list-style-type: none"> • Advanced Data Stores (ADSOs) • Defining an ADSO • Composite providers • Defining a composite provider • Changing output 	
Week 7 – Feb 21	<p>NO CLASS 2/21 – PRESIDENT’S DAY</p> <p>Transactional Data: Data Flow Objects & ETL</p> <ul style="list-style-type: none"> • Source systems • Data Sources • Extractors for data (APIs etc.) • Mapping of fields • Transformation rules • Data cleansing and harmonization • Transactional data loading into ADSOs 	
Week 8 – Feb 28	<p>Data Analyst: Queries</p> <ul style="list-style-type: none"> • Query basics • Query designer • Filter • Free characteristics • Exceptions 	

	<ul style="list-style-type: none"> • Conditions • Selections • Calculated key figures / formulas • Variables • Navigational and display attributes • Currency conversion 	
	Exam I – Mar 2	
Week 9 – Mar 7	<p>Business Analyst: Analysis for Excel</p> <ul style="list-style-type: none"> • Analysis basics • Query to Analysis for Excel mappings • Dimensions • Members • Hierarchy • Measures • Filter by member • Conditional formatting • Filter by measure <p>Enterprise Cloud Services</p> <ul style="list-style-type: none"> • Public, Hybrid, and Private Cloud • BPaaS • SaaS • PaaS • IaaS 	
Week 10- Mar 21	<p>Data Analytics Toolkit</p> <ul style="list-style-type: none"> • Data Analytics Approach • Google Colab • Github • Cloud • Python & Libraries <p>Python for Data Analytics</p> <ul style="list-style-type: none"> • Introduction to Python • Data Analytics vs Programming • Variables & Loops • Lists, Dictionaries, Sets • Functions 	
Week 11 – Mar 28	<p>Pandas for Data Analytics</p> <ul style="list-style-type: none"> • Introduction to Pandas • Data Frames: Tabular Data • Series: Column of Data • Object creation • Viewing data • Selection • Missing data • Operations • Merge • Grouping • Reshaping • Time series 	

	<ul style="list-style-type: none"> • Categoricals • Plotting • Getting data in/out 	
Week 12 – Apr 4	<p>Data Visualization - Charts</p> <ul style="list-style-type: none"> • Bokeh vs. Matplotlib • Histogram • Bar & Stacked Bar • Line • Area & Area Stacked • Pie & Donut • Scatter & Scattered Bubble <p>Data Visualization - Dashboard</p> <ul style="list-style-type: none"> • Introduction to Interactive Dashboards • Libraries • Components • Interactivity • Publishing 	
Week 13 – Apr 11	<p>Dashboard – NBA Statistics 2020-21 Regular Season</p> <ul style="list-style-type: none"> • Introduction to Basketball data • Introduction to Fantasy Sports • Define • Collect • Clean • Model • Analyze • Communicate • Automate 	IC: Google Colab, Github, & AWS RDS
Week 14 – Apr 18	<p>Dashboard – Stocks</p> <ul style="list-style-type: none"> • Introduction to Stock data • Introduction to yfinance • Trading View • Define • Collect • Clean • Model • Analyze • Communicate • Automate 	
Week 15 – Apr 25	<p>Business Forecasting</p> <ul style="list-style-type: none"> • Introduction to Time Series Analysis • Pandas for Time Series Analysis • Data Set: Renewable Energy • Time-Based Indexing • Frequencies • Resampling • Rolling windows • Trends • Data Visualization <p>Exam II – Apr 27</p>	

Week -16 - FINAL Project	Final Project Due	
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Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298
equity.usc.edu, titleix.usc.edu

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
usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity |Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs,

assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention - (213) 821-4710

campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

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

dps.usc.edu, emergency.usc.edu

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) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

ombuds.usc.edu

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.