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 three major areas:

- Data warehouses for Enterprises
- Business Intelligence for Enterprise Resource Planning Systems (ERP)
- Business Forecasting

Learning Objectives

After completing the course, students will be able to

- 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
- Author enterprise dashboards that are used to summarize and visualize data in a way that supports insight into trends
- Show how ERP business intelligence can be derived from data warehouses
- Create standard reports for business users
- Describe the various forecasting techniques

Prerequisite(s): ITP 320 or ITP 249
Course Notes
Lectures are delivered face to face in classroom. Lectures are not recorded so attendance is strongly recommended. 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.

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 to lecture** sessions to participate in hands-on activities. Students will be given tutorials to gain familiarity with software tools.

Most of the SAP software required for the class is Windows based. The software will be provisioned through the Viterbi Virtual Lab. Specifically, students will be using: (more tools may be added)

- Eclipse with SAP BW Modeling Tools
- SAP BW/4HANA (Business Warehouse)
- SAP GUI
- SAP Analysis for Microsoft Excel
- SAP Predictive Analytics
- Microsoft Excel and Access
- Amazon Redshift
- Additional tools as needed

VITERBI VIRTUAL LAB – VMWARE HORIZON CLIENT
All software can also be accessed through Virtual Desktop by logging in at: [http://mydesktop.vlabs.usc.edu](http://mydesktop.vlabs.usc.edu).

See blackboard for additional instructions on installing.

Required Readings and Supplementary Materials
[http://store.epistemypress.com/books/analytics.html](http://store.epistemypress.com/books/analytics.html)

In addition to the required reading and supplementary materials listed in the weekly breakdown section of this syllabus, additional materials will be announced in class and published on Blackboard.

Description and Assessment of Assignments
**Homework**: Most homework is computer based. Homework should be turned in to Blackboard on time. Grading will be based on completeness, accuracy, and timeliness. Feedback will be provided through Blackboard. These are individual effort assignments.

**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.
Exams: are in-class tests with multiple choice, free response, and/or live tool sections. As an example, students may be required to create an SAP query and analyze the results on a live enterprise data warehouse system as part of the “live tool” portion of the exam.

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. Each semester may have a different final project, but will include modeling the relational database required for an enterprise data warehouse, extract/cleanse/consolidate/transform heterogeneous data into a single enterprise data warehouse, and analyze data.

Project Timeline: (may differ slightly based on the individual pace of the class)
- Week 13: Project assigned
- Week 14: Solution approach and design
- Week 16: Final project due

Grading Breakdown

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Homework</td>
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<tr>
<td>In-Class Exercises</td>
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<td>Exam I</td>
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<tr>
<td>Exam II</td>
<td>25%</td>
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<tr>
<td>Group Project</td>
<td>5%</td>
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<tr>
<td>Final Project</td>
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<td>TOTAL</td>
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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.

Assignment Submission Policy
It is the responsibility of the student to make sure problem solution and assignment are turned in on time. Make sure you follow the procedures outlined in each assignment (Blackboard submissions).

Students are encouraged to work with their classmates. However, students must turn in their own, original work. Late homework submissions will be subject to a late penalty. The penalty is 25% per day. No assignments will be accepted later than four days from after the due date.

Grading Timeline
Assignments grading will typically be completed 7 days after submission. Any variations will be announced in class or on Blackboard.

Additional Policies
No make-up exams (except for documented medical or family emergencies) will be offered nor will there be any changes made to the Final Exam schedule, except as permitted by university rules. The use of mobile devices, books, notes or computers is not permitted during the exam unless explicitly specified by the professor – e.g. use of a computer for the live tool portion of an exam.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics/Daily Activities</th>
<th>READING</th>
<th>ASSIGNMENT</th>
</tr>
</thead>
</table>
| Week 1| Aug 17  | Course Introduction  
• Course objectives and outcomes  
• Large organizations  
• Role of enterprise systems  
• Enterprise data analytics  
• What is a data warehouse?  
• Types of data repositories | Lecture 1 | HW #1 (SQL)                |
| Week 2| Aug 24  | Relational Database Review  
• Types vs Instances  
• Relations, attributes, relationships  
• ER Diagrams  
• Database Normalization, normal forms  
• Denormalization of tables  
• SQL  
• JOINs  
IC#1: Data Modeling (ER Diagram & Access)  
IC#2: SQL | Lecture 2 | HW #2 (Schema) |
| Week 3| Aug 31  | Data Warehousing Concepts  
• Transactional vs Master data  
• Types and sources of data  
• Transactional databases vs. data warehouses  
• Enterprise data warehouses  
• Data store objects  
• Tabular vs Multi-Dimensional Data  
• Multidimensional Model for data warehouses  
• Star Schema  
• Dimension and fact tables | Lecture 3 | HW #3 (Schema) |
| Week 4| Sep 7   | NO CLASS ON MONDAY – LABOR DAY  
Data Warehousing Concepts (cont)  
• Difference between star schema and snowflake schema  
• Snowflake Schema  
• Master data tables  
  o Attributes – Display, Navigational  
  o Texts  
  o Hierarchies (e.g. Geo)  
IC #3: Schemas | Lecture 3 | HW #4 (Key Figures & Characteristics) |
| Week 5| Sep 14  | Data Warehouse Implementation  
• SAP HANA & BW/4HANA  
• Key Components & Tools  
InfoObjects: Key Figures & Characteristics | Lecture 4 | HW #5 (Modeling Tool)  
HW #4 (Key Figures & Characteristics) |
| Week 6 | Sep 21 | InfoObjects: Characteristics and Key Figures  
- Creating InfoObjects  
- Handling aggregations – standard and exception  
- Handling time dependency  
- Handling language dependency  
IC #4: SAP BW/4HANA Components (Eclipse)  
IC #5: Characteristics | Lecture 5 | HW #5 (ADSO & Composite Providers) |
|---|---|---|---|---|
| Week 7 | Sept 28 | InfoProviders: ADSO & Composite Providers  
- ADSO  
- Composite Provider  
- Defining ADSO  
- Defining a Composite Provider  
IC #6: InfoProviders (ADSO & Composite Providers) | Lecture 5 | HW #6 (Master Data Load) |
| Week 8 | Oct 5 | Extraction, Transformation, and Loading (ETL)  
- Source systems  
- Data Sources  
- Extractors for data (APIs etc.)  
- Mapping of fields  
- Transformation rules  
- Data cleansing and harmonization  
Data Flow Objects  
- Fact Table Loading  
- Moving data through the data warehouse  
- Process chains  
IC #7: Data Cleansing  
IC #8: Fact Table Loading  
Examination Review | Lecture 8 | HW #8 (Build Query in Eclipse) |

**Week 6**

**Sep 21**

- InfoObjects: Characteristics and Key Figures
- Creating InfoObjects
- Handling aggregations – standard and exception
- Handling time dependency
- Handling language dependency

IC #4: SAP BW/4HANA Components (Eclipse)
IC #5: Characteristics

Lecture 5
HW #5 (ADSO & Composite Providers)

**Week 7**

**Sept 28**

- InfoProviders: ADSO & Composite Providers
- ADSO
- Composite Provider
- Defining ADSO
- Defining a Composite Provider

IC #6: InfoProviders (ADSO & Composite Providers)

Lecture 5
HW #6 (Master Data Load)

**Week 8**

**Oct 5**

- Extraction, Transformation, and Loading (ETL)
- Source systems
- Data Sources
- Extractors for data (APIs etc.)
- Mapping of fields
- Transformation rules
- Data cleansing and harmonization

Data Flow Objects
- Fact Table Loading
- Moving data through the data warehouse
- Process chains

IC #7: Data Cleansing
IC #8: Fact Table Loading
Examination Review

Lecture 8
HW #8 (Build Query in Eclipse)

**Exam I Review**

**Exam I On Monday**

Queries & Designer
- Query Basics
- Query Designer
- Navigational and Display Attributes
- Calculated measures
- Currency Conversion

Advanced Features
- Hierarchical Display
- Selections
- Exceptions
- Conditions
- Variables
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<tr>
<th>Week 9</th>
<th>Oct 12</th>
<th>IC #9: Data Analyst: Queries</th>
<th>Lecture 8</th>
<th>HW# 8 (Analyze Data using SAP Analysis)</th>
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<tr>
<td>Queries &amp; Designer (cont.)</td>
<td>Topics dependent on class feedback</td>
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<td>Slicing and Dicing</td>
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<td>Pivot tables</td>
<td>Working with aggregation functions, hierarchies</td>
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<td>Currency conversion</td>
<td>Hierarchies</td>
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<td>Charting</td>
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<td>IC #10: Business Analyst: Analysis</td>
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<td>Week 10</td>
<td>Oct 19</td>
<td>Business Forecasting</td>
<td>Lecture 9</td>
<td>HW #9 (Forecasting)</td>
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<td>Time series analysis</td>
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<td>Forecasting</td>
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<td>Group Project Overview</td>
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<td>EXAM II ON MONDAY</td>
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<td>Group Project Final Project</td>
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<td>Final Project Overview</td>
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<td>Week 12</td>
<td>Nov 2</td>
<td>Special Topic: Scraping Web Data for Analytics</td>
<td>Lecture 10</td>
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<td>IC #11: Excel Power Query</td>
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<td>Week 13</td>
<td>Nov 9</td>
<td>Special Topic: Cloud Analytics</td>
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<td>IC #12: Amazon Redshift</td>
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<td>Week 14</td>
<td>Nov 16</td>
<td>Group Project Presentations</td>
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<td>FINALS WEEK</td>
<td>Final Project Due</td>
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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” [https://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, [http://policy.usc.edu/scientific-misconduct].

Support Systems
Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. [https://engemannshc.usc.edu/counseling/]

National Suicide Prevention Lifeline - 1-800-273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. [http://www.suicidepreventionlifeline.org]

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. [https://engemannshc.usc.edu/rsvp/]

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: [http://sarc.usc.edu/]

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class. [https://equity.usc.edu/]

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. [https://studentaffairs.usc.edu/bias-assessment-response-support/]

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations. [http://dsp.usc.edu]

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. [https://studentaffairs.usc.edu/ssa/]

Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. [https://diversity.usc.edu/]

USC Emergency Information
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, [http://emergency.usc.edu]

USC Department of Public Safety – 213-740-4321 (UPC) and 323-442-1000 (HSC) for 24-hour emergency assistance or to report a crime.
Provides overall safety to USC community. [http://dps.usc.edu]