ITP489  
In-Memory DBMS for Real Time Analytics

Instructor: Richard W. Vawter
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Phone: (213) 740-9541

Office Hours: M/W 10:00 - 11:00 am
12:00 - 1:00 pm (except on 1st Wed. of each month)
T/Th. 10:00 - 11:00 am

Teaching Assistant: Sheryl Daniel, sheryld@usc.edu

Course Description:
Multi-core processors and the availability of large amounts of main memory at low costs have made in-memory database management possible, enabling enterprises to collect and analyze vast amounts of data in real time. This course is designed to provide the student with a thorough understanding of the architecture and capabilities of in-memory database applications. Case studies on how businesses in various industries use data analytics for strategic decision making will be discussed and assignments will enable students to analyze large data sets to support their own strategic decisions.

Objectives:
At the completion of the course, students will be able to…
• Explain how various industries can use analytics to make strategic decisions
• Describe the architecture of in-memory database management systems
• Model and prepare an in-memory system for data population
• Identify which analytic models are most appropriate for a particular data set
• Use various tools such as SAP Predictive Analysis and SAS to analyze data
• Make strategic business decisions based upon analytic results

Suggested Textbooks:
• SAP Hana Essentials, by Jeffrey Word, , ebook version: https://www.amazon.com/SAP-HANA-Essentials-Jeffrey-Word-ebook/dp/B0089N7BHK

Suggested References
• SAP HANA Academy: http://www.saphana.com/community/implement/hana-academy
• SAS Statistics 1: Introduction to ANOVA, Regression, and Logistic Regression https://support.sas.com/edu/schedules.html?ctry=us&crs=STAT1
Online Class Setting

- Each class will be conducted “Live” using Zoom software
- On the class website, and within the “Weekly content” module, the Zoom link will be provided so you can simply click on the link and enter the Zoom class meeting.
- Later in the day following the Zoom meeting, the class link will be updated to a recording of the class discussion.
- Please note, the participation grade is based upon actively participating during the class sessions on Zoom.

Computer Software

- The software which you will be using throughout the semester is located on Vitirbi’s Virtual Lab system. By enrolling in the ITP course, you automatically have access to this system.
- Instructions on how to log in to the Virtual Lab system will be posted on the course Blackboard web page, within the “Course Information” module.

Lab Assignments:

- Assignments will be available via the “Assignments” section of the class web site.
- You are to turn in only the “Answer sheet” and “Summary” portion of the project write-up as one document.
- It is your responsibility to turn in the lab assignments by the deadlines indicated above (or otherwise stated) and verify that your assignment is available in the class “assignment box”.
  - If you can’t see or open your document, then neither can the grader!
- Answers to the assignments will be posted on the class web page immediately after the due date of the assignments for your review.

Late Assignments

- The “Assignments” section of the class web site “closes” after the due date and time.
  - You will no longer be able to submit your assignment and your assignment will be considered late!
- No late assignments will be accepted for credit. No excuses! So, please turn in your assignments at the beginning of lecture on the dates indicated above!

Handling Assignment Questions (in order of steps to be taken)

1. Re-read the instructions carefully.
2. Review the “Discussion Board” section of the class web site’s forum for other students’ questions and comments or post a question yourself to begin the forum.
3. And, of course, you are always welcome and encouraged to “stop by” during my Zoom office hours, or the TA’s, to discuss your questions.

Please note: I do not address “assignment problems” via e-mail. I am happy to discuss the problems with you “in person”, and guide you to solving them yourself during my office hours; but my e-mail address is not to be used as a simple “help desk”.
Final Project:
- The final project will require that the student take all that he/she has learned during the semester through the readings, case studies, and assignments, and apply it to a real-world company case. At minimum, the student will import data into an in-memory database system, model that data appropriately, and perform routine analytics. The student’s recommendations presented in the conclusion of the final project must be supported by their analysis of the business data.
- **No late final projects will be accepted for credit.**

Examinations: Exams cover material from the reading assignments, lectures, and assignments. There will be two parts: ① a written exam containing questions of the form: multiple choice, short answer, and short problem solving, and ② a practical “lab” portion in which you will conduct exercises similar to those in the assignments. The exams will include material presented up to the date of the exam. The “Final” exam will be comprehensive and cover material presented throughout the semester, though emphasis will be placed upon the latter part of the course.
- Exam 1: Mon. Sept. 21 2:00-3:50 p.m. On-line
- Exam 2: Wed. Oct. 14 2:00-3:50 p.m. On-line
- Final Exam: TBD TBD On-line

**Note:** No make-up exams will be offered nor will there be any changes made to the Final Exam schedule as established by the University.

Grading: Grading will be on a straight scale (as opposed to a class curve/average).
- 94% and above A
- 90% - 94% (not including 94%) A-
- 87% - 90% (not including 90%) B+
- 83% - 87% (not including 87%) B
- 80% - 83% (not including 83%) B-
- 77% - 80% (not including 80%) C+
- etc.

Final grades will be based strictly upon the total percentage earned. **No exceptions! Nor, will any extra credit assignments be offered.**

Grades will be calculated by weighing the following work as described here:
- Average of Lab Assignment scores 25%
- Exam #1 10%
- Exam #2 15%
- SAS Analysis Game 5%
- Final Project 15%
- Final Exam 25%
- Participation 5%

100%
Students with Disabilities

Any Student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 2:00 p.m., Monday through Friday. The phone number for DSP is (213)740-0776.

Policy on Religious Holidays

The University policy grants students excused absences from class for observance of religious holy days. Students should contact the instructor IN ADVANCE to request such an excused absence. The student will then be given an opportunity to make up work missed because of religious observance.

Students are advised to scan their syllabi at the beginning of each course to detect potential conflicts with their religious observances. Please note that this applies only to the sort of holy day that necessitates absence from class and/or whose religious requirements clearly conflict with aspects of academic performance. Please refer to the Holy Days Calendar http://orl.usc.edu/religiouslife/holydays/

Incomplete and Missing Grades

A grade of Incomplete (IN) “is assigned when work is no completed because of documented illness or other ‘emergency’ occurring after the twelfth week of the semester (or 12th week equivalency for any course scheduled for less than 15 weeks).”

A grade of Missing Grade (MG) “should only be assigned in unique or unusual situations… for those cases in which a student does not complete work for the course before the semester ends. All missing grades must be resolved by the instructor through the Correction of Grade Process. One calendar year is allowed to resolve a MG. If an MG is not resolved [within] one year the grade is changed to [Unofficial Withdrawal] UW and will be calculated into the grade point average as zero grade points.

Please refer to: http://www.usc.edu/dept/ARR/grades/gradinghandbook/index.html

Academic Conduct

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words.

Students who plagiarize the work of other students or provide material for another student to copy, will receive zero points and will be referred to the Student Judicial Affairs and Community Standards (SJACS) board for further action. If SJACS determines the student violated the ethics codes, the student will receive an F in the course as suggested by the University. This is non-negotiable!!

The School of Engineering adheres to the University's policies and procedures governing academic integrity as described in SCampus. Students are required to be familiar with and to observe the academic integrity standards described in SCampus, and to expect those standards to be enforced in this course. You are required to familiarize yourself with: http://www.usc.edu/student-affairs/SJACS/nonacademicreview.html
### Class Schedule:

<table>
<thead>
<tr>
<th>Week 1.</th>
<th>Aug. 17</th>
<th>Aug. 19</th>
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| **Course Overview** | - Discuss the Syllabus  
- Overview of In-Memory Database Systems | Plattner: Introduction & Ch.1  
Word: Ch. 1  
No assignment this week. |

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<tr>
<th>Week 2.</th>
<th>Aug. 24</th>
<th>Aug. 26</th>
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| **Data Analytics Simulation** | - Data Analytics Simulation: Strategic Decision Making  
- Discuss the Analytics Simulation | Class notes:  
- *Data Analytics Simulation*  
- *Data Driven Management*  
“In-Class” SIM Game of using data analytics to aid in making strategic business decisions. |

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<th>Week 3.</th>
<th>Aug. 31</th>
<th>Sept. 2</th>
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| **Relational Databases** | - Overview of Relational Databases  
- Normalization | Class notes  
Assignment #1 – Overview of RDBMS, due next Monday before class. |

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<th>Week 4.</th>
<th>Sept. 7</th>
<th>Sept. 9</th>
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| **HANA, In-Memory DBMS** | - Labor Day – no class  
- In-Memory Database Mgmt Systems & its Architecture | Plattner: Ch.4.1 – Ch.4.4  
Berg: Ch. 5.6  
Word: Ch. 2  
Assignment #2 – Overview of In-Memory DBMS, due next Monday before class |

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<tr>
<th>Week 5.</th>
<th>Sept. 14</th>
<th>Sept. 16</th>
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| **Reporting & Analysis** | - Using the HANA Studio for initial data analysis  
- Intro to Lumira for Reporting and Analysis | Berg: Ch.6  
Assignment #3 – Intro to Reporting, due **Sunday**, before 5:00 pm |

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<tr>
<th>Week 6.</th>
<th>Sept. 21</th>
<th>Sept. 23</th>
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| **Data Provisioning** | - Exam #1  
- Importing and preparing data for reporting and analysis | Berg: Ch.10  
Word: Ch. 6  
Assignment #4 – Data Provisioning, due next Monday before class |

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<tr>
<th>Week 7.</th>
<th>Sept. 28</th>
<th>Sept. 30</th>
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| **Data Modeling** | - Data Structures & the Modeling Process  
- Attribute & Analytic Views | Berg: Ch.8  
Word: Ch.7  
Assignment #5 – The Data Modeler I, due next Monday before class |

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<tr>
<th>Week 8.</th>
<th>Oct. 5</th>
<th>Oct. 7</th>
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</table>
| **Data Modeling (continued)** | - Incorporating calculations columns in modeling views  
- Using Variables and Decision Tables | Berg: Ch.8 (cont.)  
Word: Ch.7 (cont.)  
Assignment #6 – The Data Modeler II, due next **Tuesday** before 5:00 pm |

Assignments, lectures, grades, discussion and all other course materials will be posted on [http://blackboard.usc.edu](http://blackboard.usc.edu). Please check the class website regularly.
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<thead>
<tr>
<th>Class</th>
<th>Topic</th>
<th>Suggested Reading</th>
<th>Assignment</th>
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</thead>
<tbody>
<tr>
<td>Week 9.</td>
<td>Data Modeling (continued)</td>
<td>Berg: Ch.8 (cont.)</td>
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<tr>
<td>Oct. 12</td>
<td>Creating Calculation Views</td>
<td>Word: Ch.7 (cont.)</td>
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<td>Oct. 14</td>
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<td>Week 10.</td>
<td>SAP Predictive Analytics</td>
<td>Class notes</td>
<td>Assignment #7 – Predictive Analytics, due next Monday before class</td>
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<tr>
<td>Oct. 19</td>
<td>- Intro to SAP’s Predictive Analytics Tool</td>
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<tr>
<td>Oct. 21</td>
<td>- Time Series, Apriori and K-Means Analyses</td>
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<td>Week 11.</td>
<td>SAS Enterprise Miner</td>
<td>Class notes</td>
<td>Assignment #8 – Using SAS Enterprise Miner for Analysis, due next Mon., before class</td>
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<tr>
<td>Oct. 26</td>
<td>- Intro to Statistical Analysis System (SAS) for Analytics</td>
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<td>Oct. 28</td>
<td>- Data exploration &amp; analysis using SAS Enterprise Miner</td>
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<td>Week 12.</td>
<td>SAS Enterprise Miner (cont)</td>
<td>Class notes</td>
<td>Assignment #9 – Enterprise Miner II, due next Monday, before class</td>
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<td>Nov. 2</td>
<td>- Apriori, K-Means, &amp; Text Mining Analysis using SAS</td>
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<td>Final Project available</td>
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<td>Nov. 4</td>
<td>- Time Series and Regression Analysis</td>
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<td>Week 13.</td>
<td>SAS Analysis Game</td>
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<td>Final Project, due this Friday before 11:59 pm</td>
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<td>Nov. 9</td>
<td>- Begin SAS Analysis Game</td>
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<td>Nov. 11</td>
<td>- Wrap up game &amp; Course Review</td>
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<td>Week 14.</td>
<td>Final Exam – TBD</td>
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