# ITP489
# In-Memory DBMS for Real Time Analytics

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**ITP 489**, Spring 2020
**Location**: KAP 107
Tu/Th. 2:00-3:50 p.m.

**Office Hours**: M/W 10:00 - 11:50 am
1:00 - 1:50 pm *(except on 1st Wed. of each month)*
T/Th. 11:00 - 11:50 am

**Class Web Page**: https://blackboard.usc.edu/

**Teaching Assistants:** Ryan Kenneth Chua, ryankenc@usc.edu
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**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
- Graphically represent the data using dashboards
- 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:**

- In-Memory Data Management, 2nd edition, by Hasso Plattner and Alexander Zeier, Springer, ©2012, ISBN: 978-3-642-29574-4
- 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

**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.

**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 my office during my office hours or to contact me and arrange for an appointment.

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"**.

**Case Studies**

- Three case studies will be assigned during the semester. These are simply studies of business experiences similar to the topics being discussed in class.
- Students are to read over the cases and type up a one-page analysis, double-spaced, explanation of the business situation, concerns, and possible suggested actions to take.
- Case studies are to be submitted by the beginning of the lecture on the dates indicated on the syllabus via the "Assignments" section of the class website (just as you do for submitting your Assignments).
- Again, **No late case studies will be accepted for credit.**

**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 closed book / closed notes exam and ② a lab portion following the closed book / closed notes exam. The questions will be of the form: multiple choice, short answer, and short problem solving. 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: | Tues. Feb. 11 | 2:00-3:50 p.m. | KAP 107 |
| • Exam 2: | Tues. Mar. 12 | 2:00-3:50 p.m. | KAP 107 |
| • Final Exam: | Thurs. May. 7 | 2:00-4:00 p.m. | KAP 107 |

**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 will be offered.**

Grades will be calculated by weighing the following work as described here:

| | |
|---|---|
| Average of Lab Assignment scores | 25% |
| Case Study Write-Ups | 5% |
| Exam #1 | 10% |
| Exam #2 | 15% |
| Cortex Sim Game | 5% |
| Final Project | 15% |
| Final Exam | 25% |
| | 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:** *Note: While the subject matter may change, dates of the exams will not!*

| Class | Topic | Suggested Reading | Assignment |
|---|---|---|---|
| **Week 1.**<br>Jan. 14<br>Jan. 16 | **Course Overview**<br>• Discuss the Syllabus<br>• Data Analytics Simulation: Strategic Decision Making | -- | In class simulation of using data analytics to aid in making strategic business decisions.<br>. |
| **Week 2.**<br>Jan. 21<br>Jan. 23 | **Standard DBMS Systems**<br>• Discuss the Analytics Simulation<br>• Overview of standard DBMS Systems | Plattner: Introduction & Ch.1<br>Word: Ch. 1<br>Class notes | **Assignment #1** – Overview of RDBMS, due next Tuesday before class. |
| **Week 3.**<br>Jan. 28<br><br><br>Jan. 30 | **In-Memory DBMS Systems**<br>• Overview of In-Memory Database Mgmt Systems and their Architecture<br>• Discuss Case 1 | Plattner: Ch.4.1 – Ch.4.4<br>Berg: Ch. 5.6<br>Word: Ch. 2 | **Assignment #2** – Overview of In-Memory DBMS, due next Tuesday, before class<br>**Case 1** - Business Analytics in Health-care, due Thurs. before class |
| **Week 4.**<br>Feb. 4<br><br>Feb. 6 | **Reporting & Basic Analytics**<br>• Intro to Reporting and Analytics - Lumira<br>• Using the HANA Explorer for initial data analysis | Berg: Ch.6 | **Assignment #3** – Intro to Reporting, due next **Monday**, before 5:00 pm |
| **Week 5.**<br>Feb. 11<br>Feb. 13 | • **Exam #1**<br>• Hands-on Portion of Exam | -- | **Case 2** – Basecamp Pricing, due next Thurs. before class. |
| **Week 6.**<br>Feb. 18<br><br><br>Feb. 20 | **Data Provisioning**<br>• Importing and preparing data for reporting and analysis<br>• Discuss Case 2 | Berg: Ch.10<br>Word: Ch. 6 | **Assignment #4** – Data Provisioning, due next Tuesday before class |
| **Week 7.**<br>Feb. 25<br><br>Feb. 27 | **Data Modeling**<br>• Data Structures & the Modeling Process<br>• Attribute & Analytic Views | Berg: Ch.8<br>Word: Ch.7 | **Assignment #5** – The Data Modeler I, due next Tuesday before class |
| **Week 8.**<br>Mar. 3<br><br>Mar. 5 | **Data Modeling (continued)**<br>• Incorporating calculations columns in modeling views<br>• Using Variables and Decision Tables | Berg: Ch.8 (cont.)<br>Word: Ch.7 (cont.) | **Assignment #6** – The Data Modeler II, due next **Wed**, before 5:00 pm |

| Class | Topic | Suggested Reading | Assignment |
|---|---|---|---|
| **Week 9.**<br>Mar. 10<br>Mar. 12 | **Data Modeling (continued)**<br>• Creating Calculation Views<br>• **Exam #2** | Berg: Ch.8 (cont.)<br>Word: Ch.7 (cont.) | **Case 3** - Agoda: People Analytics and Business Culture, due Tuesday, March 24, before class. |
| Mar. 15-22 | ***Spring Recess*** | | |
| **Week 10.**<br>Mar. 24<br>Mar. 26 | **SAP Predictive Analytics**<br>• Discuss Case 3<br>• Intro to SAP's Predictive Analytics Tool | Class notes | **Assignment #7** – Predictive Analytics, due next Tuesday before class |
| **Week 11.**<br>Mar. 31<br>Apr. 2 | **Predictive Analytics (cont.)**<br>• Time Series Analysis<br>• Apriori and K-Means Analyses | Class notes | **Assignment #8** – Predictive Analytics, due next Tuesday before class |
| **Week 12.**<br>Apr. 7<br>Apr. 9 | **SAS Enterprise Miner**<br>• Intro to Statistical Analysis System (SAS) for Analytics<br>• Data exploration & analysis using SAS Enterprise Miner | Class notes | **Assignment #9** – Using SAS Enterprise Miner for Analysis, due next Tues., before class |
| **Week 13.**<br>Apr. 14<br>Apr. 16 | **SAS Enterprise Miner (cont)**<br>• Time Series and Regression Analysis<br>• Apriori and K-Means Analysis using SAS | Class notes | **Assignment #10** – Enterprise Miner II, due next Tues., before class |
| **Week 14.**<br>Apr. 21<br>Apr. 23 | **Enterprise Miner (conclusion**<br>• Complete the discussion of SAS Enterprise Miner | Class notes | **Assignment #11** – Comparing SAS Models, due next Tues., before class<br>**Final Project**, assigned. |
| **Week 15.**<br>Apr. 28<br>Apr. 30 | **Cortex Anlaytic Sim Game**<br>• Begin Cortex Sim Game<br>• Wrap up game & Course Review | -- | Final Project, due this Friday before 11:59 pm |
| **Week 16.**<br>May 7 | **Final Exam** – 2:00-4:00 pm | | |