

**Objective** 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. “Big Data” analytics 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 two major areas –

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

After completing the course, students will be able to

- Describe the components of a 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. Also the ability to perform “what-if” analysis in real time.
- Show how ERP business intelligence can be derived from data warehouses
- Create standard reports for business users
- Derive insightful trends using data mining techniques

**Concepts** *Enterprise Data warehouses* aim at physically framing multiple sources of data (e.g., databases and file collections) in an architecture that requires the mapping of data from one or more operational data sources to a target database management system (DBMS, e.g., Oracle) that supports the many decision making processes and business intelligence (BI) systems of an enterprise.

*Business Intelligence* for ERP is the user-centered process of exploring data, data relationships and trends - thereby helping to improve overall decision making for enterprises. This involves an iterative process of accessing data (ideally stored in the enterprise data warehouse) and analyzing it, thereby deriving insights, drawing conclusions and communicating findings.

**ERP System** **SAP** is the leading vendor of Enterprise Resource Planning Systems in the world. ITP/USC has a *University Academic Alliance* with SAP America for the past 16 years. Several ITP courses utilize the SAP system as a tool and platform for class projects and homework.

ITP 487 uses the SAP BW (Business Information Warehouse) tool extensively. All projects and exercises are conducted within the system. Students have the prerequisite exposure to SAP in their prior class. The data that is analyzed in ITP 487 comes from SAP ERP which is a transactional system. The tight integration of data between SAP ERP and SAP BW is key to skill building exercises in the course.

**Instructor** Nitin Kalé, [kale@usc.edu](mailto:kale@usc.edu), OHE 412, 213.740.7083

**Office Hours** 10:00-12:00 Tu, 2:30-4:30 W

**Lecture/Lab** 2 – 4:50 pm, Monday, OHE 540

**Lab Asst/Grader** Ying Zhou, zhou607@usc.edu

**Website** blackboard.usc.edu

All lecture notes, assignments, news, announcements and grades will be posted on USC Blackboard. Students are expected to check the class website frequently. **Use the discussion boards to ask and answer questions.**

**Prerequisite** ITP 320 or ISE 382 or ISE 583

**Text Books**

- Extensive lecture notes and online resources will be provided in class.

Optional Reference books –

- Reporting and Analysis with SAP BusinessObjects (2nd Edition), ISBN: 978-1-59229-387-2 , Ingo Hilgert , SAP Press
- Mastering the SAP Business Information Warehouse, Kevin McDonald, Wiley Publications
- OLAP Solutions: Building Multidimensional Information Systems, Erik Thomsen, Wiley Computer Publishing

**Software** Most of the SAP software required for the class is **Windows** based. This software will be provided to you free of charge for academic use. Specifically, you will be using

- SAP GUI 7.30 for Windows
- SAP BW
- SAP Business Explorer Query Designer
- SAP Crystal Reports
- SAP BusinessObjects Explorer
- SAP BusinessObjects Dashboard Design
- SAP BusinessObjects Analysis
- SAP BusinessObjects Web Intelligence
- SAP Predictive Analysis
- SAP Design Studio
- Microsoft Excel and Access (not provided free)
- SAP HANA

ITP labs have all of this software installed. You will also have access to Viterbi remote desktop server where you can work remotely.

**Grading** The final grade will be based upon the total percentage earned. The weight of graded material during the semester is listed below. **No extra credit assignments will be offered.**

Weekly Homework	30%
Final Project	10%
Midterm	25%
Final Exam	35%
Total	100%

*Grading scale (percentage):*

A	100-95
A-	95-92
B+	92-89
B	89-86
B-	86-83
C+	83-80
C	80-77
C-	77-74
D+	74-71
D	71-68
D-	68-65
F	65 or below

**Course Policies**

- Projects turned in after the deadline will automatically have 10 points per day deducted.
- No make-up exams (except for medical or family emergencies) will be offered nor will there be any changes made to the Final Exam schedule.
- Before logging off a computer, students must ensure that they have saved their work (on their personal email accounts or flash drives) created during class. Any work saved to the computer will be erased after restarting the computer. ITP is not responsible for any work lost.
- ITP offers Open Lab use for all students enrolled in ITP classes. These open labs are held beginning the second week of classes through the last week of classes.

**Academic Integrity**

The use of unauthorized material, communication with fellow students during an examination, attempting to benefit from the work of another student, and similar behavior that defeats the intent of an examination or other class work is unacceptable to the University. It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tension accompanying examinations. When the professor determines that a violation has occurred, appropriate action, as determined by the instructor, will be taken.

Although working together is encouraged, all work claimed as yours must in fact be your own effort. Students who plagiarize the work of other students will receive zero points and possibly be referred to Student Judicial Affairs and Community Standards (SJACS).

The School of Engineering adheres to the University's policies and procedures governing academic integrity as described in SCampus. Students are expected to be aware of and to observe the academic integrity standards described in SCampus, and to expect those standards to be enforced in this course.

All students should read, understand, and abide by the University Student Conduct Code listed in SCampus, and available at:

<http://www.usc.edu/student-affairs/SJACS/nonacademicreview.html>

**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. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213)740-0776."

**Policy on Religious Holidays**

University policy grants students excused absences from class for observance of religious holy days. Students should contact instructor IN ADVANCE to request such an excused absence. The student will 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/>

# Data Warehouses and Business Intelligence

## ITP 487 (3 Units)

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### Course Outline

Note: Weekly homework and final project will be assigned during lecture (and posted on Blackboard)

#### Week 1 – Aug 26<sup>th</sup> – Course Introduction

- Course objectives and outcomes
- What is Business Intelligence?
- Why do we need Data Warehouses?
- What is Data mining?
- Pivot Tables

#### Week 2 – Sept 2<sup>nd</sup> - Labor Day – University Holiday

#### Week 3 – Sept 9<sup>th</sup> - Relational Database review

- Relations, attributes, relationships
- Database Normalization, normal forms
- Denormalization of tables
- SQL

#### Week 4 – Sept 16<sup>th</sup> - Data Warehousing fundamentals

- Transactional databases vs. data warehouses Multidimensional Model for data warehouses
- Differences between traditional star schema and SAP BW star schema
- Dimension and fact tables
- Modeling and creating the InfoCube (star schema) in SAP Administrator Workbench

#### Week 5 – Sept 23<sup>rd</sup> – Modeling the data warehouse

- Data sources, operational data store, data marts
- Characteristics and key figures
- Creating InfoObjects
- Building InfoCubes

#### Week 6 – Sept 30<sup>th</sup> - Data Extraction, Transformation and Loading (ETL) in SAP BW

- Extraction from data sources such as SAP ERP
- Flat file extraction
- Defining and using Persistent staging areas PSA
- Data Store Objects DSO
- Loading master data
- Loading transactional data

#### Week 8– Oct 7<sup>th</sup> - Introduction to Business Intelligence with SAP Business Objects Analysis

- Navigating in reports
- Designing queries in the Query Designer
- Using InfoProviders and InfoObjects for queries
- Calculated and restricted key figures in BEx
- Properties and attributes of characteristics
- Hierarchies

- Query properties and navigation
- Exceptions and Conditions

**Week 7**– Oct 14<sup>th</sup> – Front end visualization of business intelligence

- Designing Dashboards

**Week 9** – Oct 21<sup>st</sup> - **Midterm Exam**

**Week 10**– Oct 28<sup>th</sup> – Designing reports

- BusinessObjects Web Intelligence
- Crystal Reports

**Week 11**– Nov 4<sup>th</sup> - Data Mining

- Statistical techniques in data mining
- Preparing data for mining
- Association analysis, market basket analysis
- Clustering
- Classification

**Week 12**– Nov 11<sup>th</sup> – Data Mining contd.

- Regression
- Decisions Trees

**Week 13**– Nov 18<sup>th</sup> – Building analytics applications

- Mobile analytics

**Week 14**– Nov 25<sup>th</sup> – In Memory Analytics

- Row vs. columnar databases
- In-memory databases

**Week 15** – Dec 2<sup>nd</sup> - Final Project

- Deriving business insight using big data
- Using a combination of techniques explored during the semester to answer business decision questions
- Tyson Foods data is provided via a data warehouse populated from Teradata

**Week 16** – Final Exam, 2-4 pm, Friday Dec 13<sup>th</sup>