

**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. 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
- Show how ERP business intelligence can be derived from data warehouses

**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 an *Academic Alliance* with SAP America for the past 10 years. Several ITP courses utilize the SAP system as a tool and platform for class projects and homework.

ITP 487 uses the SAP BIW (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 (ITP320/ISE382). 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 BIW is key to skill building exercises in the course.

The particular methodology of the SAP BIW system, although based on general concepts, is highly technical and complex thereby providing a powerful tool for data analysis.

Students will receive software (SAP GUI) to connect to the SAP BIW server so that they can work from their personal computers.

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

**Office Hours** 2 – 4 pm, Wed and Thurs

**Lecture/Lab** 2 – 4:50 pm T | KAP 267

**Open Lab Hours** KAP 267  
Monday, noon - 5 pm  
Thursday, noon - 5 pm  
Friday, 11 am - 4 pm

Availability of computers is on a first-come, first-served basis. Course lab assistant will not be present. Use these extra lab hours to work on your projects, however, it is hoped that you will be able to complete the projects during class time listed above.

**Website** [blackboard.usc.edu](http://blackboard.usc.edu)

All lecture notes, assignments, news, announcements and grades will be posted on Blackboard. Students are expected to check the class website frequently.

**Lab Asst/Grader** Sujata Dhole, [dhole@usc.edu](mailto:dhole@usc.edu)

**Prerequisite** ITP320x or ISE 382 or equivalent

**Recommended Preparation** IOM 428

**Text Books** Recommended Reference books –

- Extensive lecture notes will be provided in class.
- Mastering the SAP Business Information Warehouse, Kevin McDonald, Wiley Publications
- OLAP Solutions: Building Multidimensional Information Systems, Erik Thomsen, Wiley Computer Publishing

**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.**

Projects	30%
Final Project	10%
Midterm	25%
Final Exam	35%
Total	100%

**Final letter grade is based strictly on total percentage earned. NO EXCEPTIONS!**

*Grading scale (percentage):*

A	100-95
A-	94-91
B+	90-87
B	86-83
B-	82-79
C+	78-75
C	74-71
C-	70-67
D+	66-63
D	62-59
F	58 or below

- Policies**
- Projects turned in after the deadline will automatically have 5 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 emailed or saved projects created during the class or lab session. 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. Please contact your instructor for specific times and days for the current semester.

**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."

# Data Warehouses and Business Intelligence

## ITP 487 (2 Units)

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### Course Outline

*Note: Weekly projects are assigned and discussed during lab hours*

#### **Week 1** – Course Introduction

#### **Week 2** – Relational Database review

- Relations, attributes, relationships
- Database Normalization, normal forms
- Denormalization of tables
- Transaction databases vs data warehouses

#### **Week 3** – Data Warehousing

- What is Business Intelligence for large enterprises
- Why do we need Enterprise Data Warehouses□
- What is Data mining in ERP?
- SAP Business Information Warehouse
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#### **Week 4** – Multidimensional Model

- Differences between traditional star schema and SAP BW star schema
- Modeling and creating the InfoCube (star schema) in SAP Administrator Workbench
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#### **Week 5** – InfoCubes, InfoObjects

- Creating InfoObjects
- Business Content in SAP
- Business area specific modeling and tools
- Building InfoCubes
- Adopting and modifying preconfigured InfoCubes derived from ERPs

#### **Week 6** – Data Extraction, Transformation and Loading (ETL) in SAP BW

- Extraction from data sources such as SAP ERP
- Loading transactional data
- Direct and flexible updating
- Loading master data
- Third party extraction tools
- Extracting from databases using DB connect
- Flat file extraction
- Defining and using Persistent staging areas

#### **Week 7** – Administration of InfoCubes and Aggregates

- Managing InfoCubes
- Aggregation of transactional data

#### **Week 8** – Virtual cubes and MultiProviders Data from ERP Data Marts

- What are Data marts?
- Virtual Cubes

**Week 9 – Midterm Exam**

**Week 10** – Introduction to Business Intelligence with SAP Business Analyzer (BEx)

- SAP BIW reporting
- Navigating in reports
- Using the BEx Business Analyzer
- Designing queries in the Query Designer
- Using InfoProviders and InfoObjects for queries

**Week 11** – Calculated and restricted key figures in BEx

- Properties of key figures

**Week 12** – Characteristics in an ERP

- Properties and attributes of characteristics
- Integrating hierarchies into reports
- Creating user-defined hierarchies

**Week 13** – Query Properties

- Query properties and navigation
- Exceptions
- Conditions
- Customizing workbooks
- Charting

**Week 14** – Strategic Enterprise Management

- Using a data warehouse for SEM
- Use of dashboards and cockpits for decision support

**Week 15** – Data Mining

- Statistical techniques in data mining
- Example of a decision tree
- Final Project using Tyson Foods data

**Week 16** – Final Exam, Thursday Dec 11<sup>th</sup>, 2 – 4 pm