NYU | TANDON SCHOOL OF ENGINEERING

ECE-GY-9953 (Advanced Project I)

ECE-GY-9941 (Advanced Project III)

Course Section format:

Independent Study (no regular class, assignment, exams). If needing any personal assistance, zoom meeting can be arranged on request basis, on Sunday only.
This course will be purely on project development with advanced database features.

Start Date: 09/02/2021
End Date: 12/14/2021

Bi-Weekly "Status and Progress report "is required to submit on NYC classes. Due date will be Alternative Sunday, by 11 PM EST. The dates for submitting "Status and Progress Report" are as follow.

09/12/2021
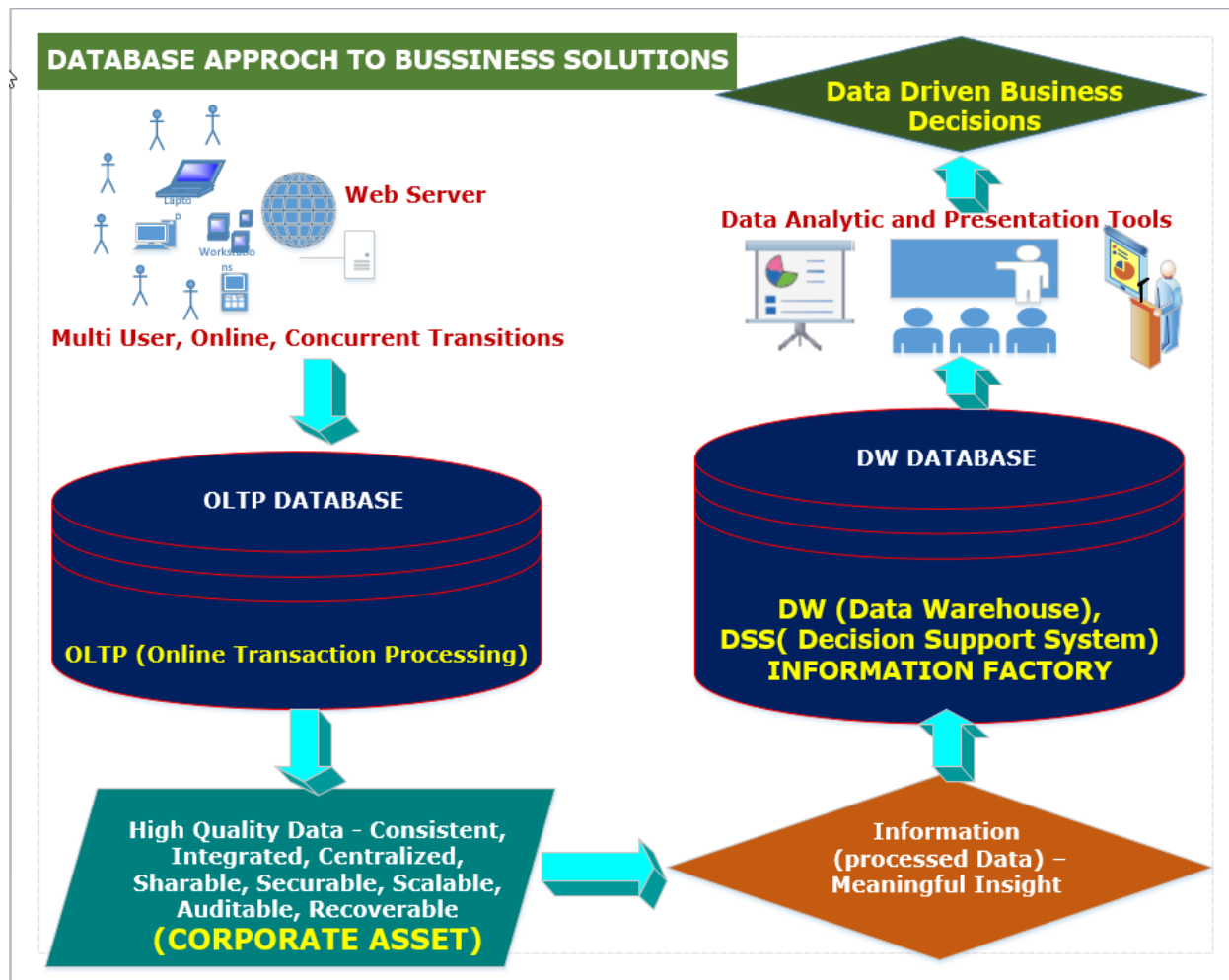**09/26/2021**
10/10/2021
10/24/2021
11/07/2021
11/21/2021

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Grading Policy:

Project Status Report:	**12%**
Database Designs:	**15%**
Development and Implementations:	**30%**
Web Application/Analytics	**15%**
Project Demo:	**10%**
Project Presentation:	**10%**
Project report:	**8 %**

DB project topology:

Suggested inclusions:

- **The project will have two different database systems of different vendor products**
  (E.g. Oracle and MySQL)
- **One database will be of OLTP database (Online Transaction Processing System) and other database will be DW (Data Warehouse – DSS)**
- **Web application will be interfaced with OLTP database**
- **Reporting tool / Analytics tool will be interfaced with DW database**
- **There will be ETL (Extract, Transform, and Load) database code to load data from OLTP database, transform it matching DW schema design, and then loading it to DW database.**
- **There will be CDC approach (Change Data Capture) for ETL database routine to implement incremental ETL**
- **Will use advance database features e.g. External tables, Partitioned Tables, function base indexes, PL/SQL(procedures, functions, packages, triggers)**

- **The online application will have robust security features, validations, user self-services (password management by users, security questions & validations) etc. [For 3 credit course only]**
- **The DW systems, will have more analytics and reporting for making business decisions**
- **There will be development for EDI (Electronic Data Interface), SQL Loader (DB utility for loading data to database from a text file)**
- **There will be role base database security management**
- **There will be use of data movement utilities (exports/import, SQL Loader etc.)**
- **There will be use of data analytics using data visualization tool, such as Tableau, ClickView etc.**

Suggested Business Case:

WOW (We Offer Wellness), Health Information Management Systems, for a healthcare group having number of hospitals affiliated with it.

The OLTP database schema should include details about:

- **Patients**
- **Doctors, Nurses, non-medical staff**
- **Hospitals**
- **Rooms**
- **Patients appointments**
- **Lab and lab results**
- **ICD codes (International Classification of Disease)**
- **Treatments**
- **Billing**
- **Insurance providers**
- **Payment receipts**

    WOW has undertaken a project to centralized data from all affiliated hospital to standardize data format across the system. WOW has engaged your team to design, develop, test and implement OLTP (Online Transaction Processing) and DW (Data Warehouse) database system as first part of this project.

    Following business rules have been identified as initial requirement analysis.

    a) **For all affiliated hospitals WOW intend to store hospital name, address, specialty, emergency hotline phone numbers, general inquiry phone numbers, registration and administration phone numbers, department**

names, department phone number, and department location (building name and floor)

b) Each affiliated hospital can have full time doctors or consulting doctors. Also, a doctor may work with multiple hospitals. For each doctor, WOW intend to store doctor's name, office phone number, personal phone number, and specialty. In addition, for full time doctors, WOW intend to store hire date, and yearly compensation; and for consulting doctors, WOW intend to store contract date, contract number, weekly contract rate, minimum weekly hours, and overtime rate/hour.

c) WOW intend to store name, address, phone number, birthdate, race, marital status, gender, insurance company name, insurance number, and blood group of each patient. In addition, for each patient WOW intend to store name, address, phone number, and relationship of emergency contact person. A patient can have more than one emergency contact person.

d) Patient can be in-patient or out-patient. For out-patient, WOW intend to store follow-up date and for in-patient WOW intend to store bed number, floor, and discharge date

e) WOW maintains registration of patients. A patient may have multiple registrations for different treatments. WOW maintains registration number and registration date

f) A doctor can treat multiple patients, patients can be created by multiple doctors

g) A doctor can provide treatment for multiple diseases and each disease can be cured by multiple doctors

h) For each disease, WOW intend to store ICD (International Code of Disease), discerption, type of the disease (seasonal, viral, infectious, genetic, deficiency, physiologic, chronic etc.)

i) For each treatment provided to patients, WOW intend to store treatment date, treatment type (Laboratory order, Drug prescription Surgery etc.), treatment result status (Complete, Follow-up or Terminated), and treatment description. For laboratory treatment type, WOW intend to store laboratory name, test type, test date, and test result (positive/ negative/ potential). For drug prescription treatment type, WOW intend to store drug name and dose. For surgery type of the treatment, WOW intend to store name of surgery, description, surgery date, and result (Successful/Unsuccessful). A patient can have more than one type of the treatment.

j) When treatment status is marked as Complete or Terminated, WOW generate invoice for each registration. Invoice includes data about invoice number, invoice date, Laboratory Cost (if any), Prescription Drug cost (if any), Surgery cost (if any), Bed usage cost (if any), total cost, bill_to_insurace, and cost_to_patient.

k) WOW receives payments from insurance company and patients against each invoice. There may be multiple payments by insurance company or patient again each invoice. For each payment, WOW intend to store payment date, payment amount, payment type (Credit Card, Debit Card, EFT, Check)

Each Table in OLTP DB system will have a column called TBL_LAST_DATE, and this column should be updated with system timestamp via trigger, whenever record is inserted/updated. This is required to facilitate CDC base incremental ETL to DW system.

History tables:
- **Patients heath history**
- **Patients Treatment history**
- **Employment history**

Database Design:
At least up to 3rd Normal form for OLTP system, De-normalized form for DW systems

YOU MAY BRING YOUR OWN BUSINESS CASE AND/OR OWN PROJECT, which is subject to approval by the professor. Projects selection and need to be completed by Sunday, 09/12/2021 11PM EST and should be reported in first Status and Progress report submission. You can deploy DB/Application locally or on cloud platform (AWS, GCP, Azure etc.).

Project Demo:
Demo Date for all group: Sunday, 12th December, 2021, starting 10AM EST. Each group will have 30 minutes of demo. Time slots will be allotted accordingly. The demo will be via Zoom meeting. Each team member needs to be present at the demo.

Final Project Report:
Submission deadline Tuesday, 14th December, 2021 11PM EST
A comprehensive project report needs to be submitted. The suggested format will be provided.

Final presentation:
There will be project presentation (power point or similar) by each project group and Q&A by other groups. The date of final presentation will be announced.